AUG 17 1944

The Welding Engineer

AUGUST, 1944

THE PIONEER TECHNICAL PUBLICATION OF THE WELDING INDUSTRY

When You Need Welding Cable Quickly

"MAJOR" WELDING CABLE

"MAJOR" Welding Cable was the first extruded type insulated super-flexible welding cable on the market. Introduced and pioneered in 1934. Today, the leading welding cable in shipyards, fabrication and ordnance plants.

"MAJOR" Welding Cable has WPB approved synthetic rubber jacket, that has high tensile strength, maximum abrasion resistance, is tough, durable, water and oil proof. Super-flexibility is achieved by proper stranding of many fine bare copper wires, which form the conductor.

Sizes: #6 to 4/0
Amps: 75 to 550

Supply Dealers are located everywhere within phone call of your office – Qualified to quote lowest prices, make prompt delivery from stock, or arrange speedy shipment from our factory.

Write, Wire or Phone

WELDING ENGINEERING COMPANY
MANUFACTURERS . . DISTRIBUTORS
MILWAUKEE 2, WISCONSIN
Offices and Agents all over the United States

A DREAM COME TRUE

The Holder always hoped for...

Jackson's *Featherlight* A-4

You have dreamed of the ideal holder—the holder you hoped would some day be created and offered for sale.

Today, you can have it!

We have created this holder and carefully field tested it to meet the exacting specifications of your ideal. We offer it to you as the finest holder ever developed. Welders who have used Featherlight A-4 and A-5 tell us they are "dreams come true".

Study the illustration, consider the advantages and you'll understand why the purchase of these holders is a profitable investment.

- **Featherlight:** *40% weight reduction.*
- **Tongs** *are of tough light weight alloy.*
- **Copper Jaws,** *quickly and easily replaceable.*
- **Insulators:** *New Crown Type with Metal-Clad jaw insulators . . . last many times longer.*
- **Maintenance:** *Replaceable Copper Jaws and Metal-Clad jaw insulators cut maintenance of Jackson Holders 50%.*
- **Ventilation:** *Free flowing . . . no holder works cooler.*
- **New Tong Pivot-Hinge:** *Easily knocked down and assembled.*
- **Cable Connection:** *Mechanical.*
- **Capacity:** *A-4, ¼" electrodes. A-5, ⅜" electrodes.*

Contact your nearest Jackson dealer or write to us.

JACKSON PRODUCTS 3265 Wight Street, Detroit 7, Michigan

In Canada: Hollup Corporation Limited, Toronto • Paragon Supplies Limited, Vancouver

The Welding Engineer

Welding • Cutting • Brazing • Flame-Treating • Metallizing

as applied in

Design • Engineering • Construction • Production • Maintenance

VOL. XXIX, NO. 8 AUGUST, 1944

IN THIS ISSUE

ARTICLES

Welded Diesel Manifold 27
B. E. VANKRIMPEN

Beveling Tube Intersections 30
T. B. JEFFERSON

"Nervous Weld" Process 32
CLYDE B. CLASON

Building with Steel Tubing 34

Stress-Relief Welding 37
GLENN F. CROSIAR

Cleaning Aircraft Parts 38
TEMPLE DAVIS

Skip Welding Thin Stainless 41
JOSEPH S. WRIGHT

Welded Ships Okayed! 42

Editorial 25

Welded Reinforcing for Concrete Pipe 36

On the Job 46

Short Cuts and Kinks 54

New Products to Use 60

News of the Industry 74

Engineering Data Sheet No. 47 77

About People 82

Helpful Literature Just Published 88

From the Patent Office 92

Classified 109

Advertisers in This Issue 110

ABP ABC MEMBER

Associated Business Papers
Audit Bureau of Circulations
American Welding Society
International Acetylene Association

G. H. MACKENZIE
President and Treasurer

T. B. JEFFERSON
Editor

CLYDE B. CLASON
Associate Editor

ROBERT L. SIMON
Promotion Manager

» «

Eastern Representative:
T. E. DEPEW, 1819 Broadway
New York 23, N. Y.
Tel. Columbus 5-7843

Midwest Representative:
D. R. WATSON, 75 E. Wacker Drive
Chicago 1, Tel. Andover 3135

Pacific Representative:
W. R. McINTYRE, 832 W. 5th St.,
Los Angeles 13, Tel. Mutual 6306

» «

Published on the 1st of each month by The Welding Engineer Publishing Co., 506 So. Wabash Ave., Chicago 5. Phone Webster 7134

Copyright, 1944, by The Welding Engineer Publishing Co.

Subscription, United States, possessions, and Canada, $3 a year; foreign countries, $4 a year; single copy, 35 cents. Entered as second-class matter January 20, 1916, at the postoffice at Chicago, Illinois, under the act of March 3, 1879.

FOREIGN REPRESENTATIVES: AUSTRALIA and NEW ZEALAND—R. Hill, Matlock House, Davenport, Auckland, New Zealand; BRAZIL—Alpha Jewel, Caixa Postal No. 2411, Rio de Janeiro, Brazil; GREAT BRITAIN—A. D. Baynes, 1 Cambridge Park Court, Twickenham, Middlesex, England; SOUTH AFRICA—J. W. Arnison, 35a Victoria Avenue, Benoni, Transvaal, South Africa; U. S. S. R.—Mesdunarodnaja Kniga-Kusnezki Most 18, Moscow, U. S. S. R.

SMITHway Electrodes in Action

This large, all-welded structure weighing 28,000 pounds is one of a number of stern frames for cargo ships being produced in the A. O. Smith plant for Walter Butler Ship Builders, Inc., at Duluth, Minnesota.

It is another example of the many applications of SMITHway welding technique that is speeding production in the war effort.

The Proof Is in Production

YOU won't find welding electrodes *anywhere* that are put through the paces we give them in our own testing laboratories. That's because *thoroughness* is *fundamental* with us.

And that's fine as far as it goes. But our *real* test is our *shop* test—where over 320,000 electrodes a day go *into actual production* . . . into welded products we make right here in the A. O. Smith plant . . . into some of the largest and most complex structures ever welded.

You bet those electrodes have to be good—*better* than good—as near perfect as production tools can be made.

That's why we make our own—why we offer the *same* electrodes to you!

The final proof of SMITHway Certified Electrodes *is* indeed *in production!* They are shop-tested and proved long before you get them. That's why they are *right*—why they are uniform in quality and characteristics—why they are able to deliver *more* good welds per man hour at the *least* possible cost.

Mild Steel . . . High Tensile . . . and Stainless Steel
WELDING ELECTRODES

made by welders . . . for welders

Have You Bought That Extra War Bond This Month?

SMITHway A. C. Welding Machine saves power; eliminates arc blow.

SMITHway Welding Monitor trains better welders faster.

A. O. SMITH Corporation

MILWAUKEE · WISCONSIN · HOUSTON · TEXAS

Offices in: NEW YORK, PITTSBURGH, CHICAGO, TULSA, HOUSTON, LOS ANGELES, SEATTLE

In Canada JOHN INGLIS CO., LIMITED

The Welding Engineer

AMERICA'S PIONEER WELDING JOURNAL

Established 1916

Needed: An Educational Job

Industrial advancement is probably the only good that ever will come from any war. In the hothouse of the present conflict a whole generation of progress has been forced to maturity in the short space of a few years. Especially, have outstanding advances in the use of welding been developed under the spur of wartime necessity.

Welding was the answer to the dilemma of the metal working industry when confronted with the problem of producing the largest volume of goods ever called for during the period of the greatest shortage of essential materials ever experienced in the United States. It is fortunate indeed that the various welding processes were available. Welding has proved an effective means of conserving materials. At the same time, it has enabled our armed forces (and those of our allies) to be provided with ships and weapons of war at unbelievable production rates.

Never before have ships been turned out with such rapidity. Never before has a military tank been so strong. Never before have weapons been so light yet so efficient. And never before have welding methods been used so extensively.

We will readily admit that welding is not a cure-all for all production troubles—and admit also that it is not necessarily the best joining method for every job. Granting that, there is simply no reason why welding should not be used wherever it has been found applicable.

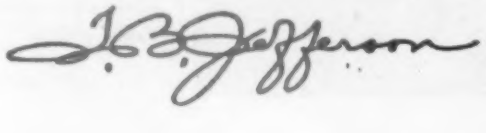
Nevertheless there are still hidebound reactionaries who consider welding as something to be tolerated during the war emergency but which will be of little value when the fighting is over. This feeling exists especially in some of the older shipyards. We urge those who feel that welding is purely a war expedient to turn immediately to page 42 and read the abstract of a report of a Navy Committee investigating welded ship construction. It leaves them with very few legs to stand upon.

That such a feeling can exist at all, however, shows that the welding industry cannot rest on its laurels. There are those who would turn back time—throw away progress. We ask, "Why?" Why should executives and engineers who have learned of the efficiency and economy of welding revert to slower, more costly and less efficient joining methods? Then we wonder if we of the welding industry have done the proper job of educating the newer users of welding. Maybe that is the answer.

The public has learned much about welding during the war years, but, unfortunately, much of its knowledge has been derived from newspapers telling how poorly a few welded ships have made out. A good ship has no news value so nothing is said about the thousands of welded ships that have proved satisfactory. This one-sided impression should be counteracted, or many potential users of welding will shy away.

The old fogies and mossbacks, too, must be educated—taught the fundamental and economical advantages of welding. And users of welding should also be educated in order to avoid misapplications. It all adds up to work and expense, but it must be done somehow.

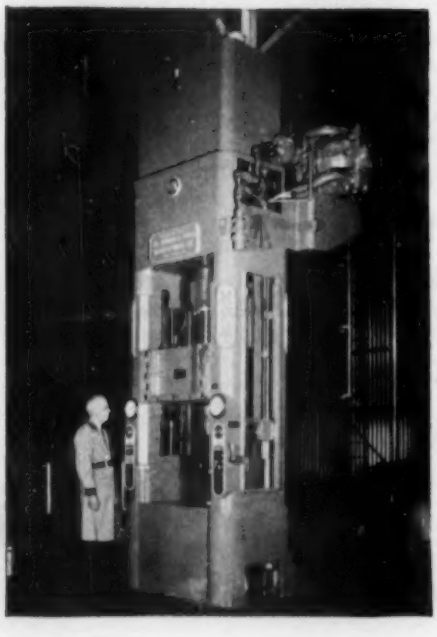
For every present application of welding, there should be at least six postwar applications. The extent to which this potentiality is fulfilled will depend in no small measure upon the educational work undertaken by the welding industry.



THIS HELIXAUST MANIFOLD for diesel engines, fabricated by Dayton Fabricated Steel Co., increases engine efficiency by reducing back pressure. 3/16″ fillet welds are made with Murex Type FHP Electrodes, selected because of their excellent "hot" rod characteristics. All-position Vertex rods are used for the circumferential butt welds.

INSPECTING MUREX ELECTRODES. Careful production control—from raw materials to packing—is one of the reasons for uniform results with Murex.

THE DRAFT SILL ASSEMBLY of a freight car is being welded with Murex Electrodes in the plant of Pullman-Standard Car Manufacturing Company. Downhand rods are used because they are ideal for long, horizontal fillets and deposit sound X-ray clean weld metal at a rapid rate.



ARC WELDING, with Murex Electrodes, speeds the fabrication of cartridge case drawing presses for The Hydraulic Press Manufacturing Company. Instead of using steel castings throughout (the conventional method), the cylinder, slide and numerous other parts are arc welded. Vital production time is saved and the company is not dependent on outside casting facilities. Positioning equipment permits the use of "hot," downhand Murex Electrodes, resulting in fast deposition, low cost and sound, X-ray clean welds.

MUREX
ARC WELDING ELECTRODES
•
METAL & THERMIT CORPORATION
120 Broadway, New York 5, N. Y.
ALBANY • CHICAGO • PITTSBURGH
SOUTH SAN FRANCISCO • TORONTO
Specialists in welding for nearly forty years. Manufacturers of Murex Electrodes for arc welding, and of Thermit for repair and fabrication of heavy parts.

Welded Diesel Manifold

Fig. 1—The manifold is here pictured at an early assembly stage. The inner water-cooled chamber is shown with the separating baffel vanes tacked in place.

It's news in precision welding when a highly complicated assembly is successfully held to 1/16 in. tolerance in a 10 ft length. The "Helixhaust" manifold has a design so complex that it could not be fabricated by casting except at a prohibitive cost. So it had to be welded.

By **B. E. VANKRIMPEN**
Production Manager,
The Flori Pipe Co.

WHEN this present conflict is successfully brought to an end and we all turn our energies and ingenuities to better living conditions, undoubtedly new methods and products never before dreamed of as being possible will be brought to life. Ways and means of solving various problems have made tremendous strides during the last few years —as a result of necessity caused by material substitutions, labor shortages, etc., or simply to satisfy the demand for a better product.

Intricate Castings Replaced

Welding by arc or oxy-acetylene torch is one of the babies that has grown to adolescence in a very short while, but it is believed, and rightly so, that it will not reach the adult stage for some time. Nobody can foresee at this time the possibilities of what will be in store for the welding enthusiast or just how soon Wilma the Weldor will entirely replace "Rosie the Riveter." In many cases, however, welded construction has successfully replaced intricate casting construction; in some of these cases the prescribed requirements render it impossible to fabricate the product in any other way. Particularly is this true when the weight of the finished product must be kept to a bare minimum.

Faced with just such a problem, the inventors of the "Helixhaust" manifold searched everywhere for a means to fabricate this manifold with a minimum of weight and size, and found that welding was the only method that would satisfy the specifications of this newly designed piece of equipment. The "Helixhaust," a recent development in water-cooled exhaust manifolds for Buchi turbocharged diesel engines, makes it possible to increase the horsepower of any diesel engine, new or already in service, from 30 to 50%, dependent on the machine design.

The Busch-Sulzer Bros. Diesel Engine Co., oldest builder of diesel engines in America, was quick to realize the advantages of this new design of exhaust manifolding as compared to the older multipipe Buchi system but needed a manufacturer willing to fabricate these manifolds according to the strict specifications. We of the Flori Pipe Co., St. Louis, are proud—and rightly so—that this problem of fabrication was, so to speak, thrown in our lap for consideration, thus giving us the opportunity of converting the concept into a reality.

A Difficult Job

Everyone familiar with arc welding is also familiar with the problems caused by expansion and contraction when the heat of the arc is applied to metal. These variations in heat condition are likely to cause warpage or cause the part being welded to assume a different shape. These troublesome problems were with us in an intensified form in the building of "Helixhaust" manifolds.

The use of welding was mandatory because the assembly is so complicated as to make the cost of a cast manifold prohibitive. This complicated assembly, however, made it necessary for us to hold deformation to the lowest possible minimum. It can readily be seen from the accompanying pictures that there is simply no way to straighten the assembly should serious distortion occur. Consequently, welding procedures and methods of alignment were of the utmost importance on this job.

The manifold when assembled is about 10 ft long, has an OD of about 10 in. and weighs approximately 1,000 lb. An idea of the true magnitude of the job, however, may be gained from the fact that hundreds of feet of welding are required for the assembly of one manifold.

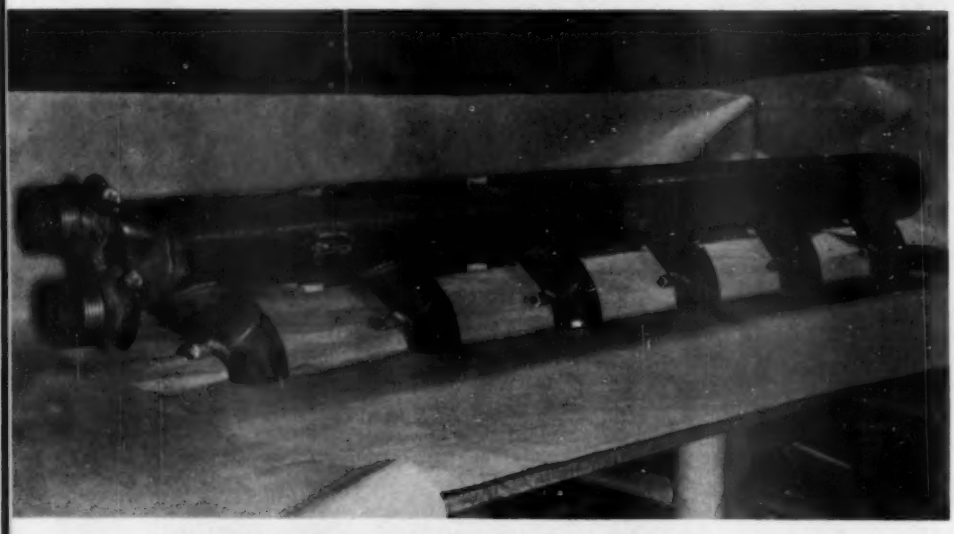


Fig. 2—The inner pipe with exhaust elbows and ring-grooved castings has been welded into the assembly. Spacer lugs have also been welded into place to provide uniform spacing between the inner pipe and outer jacket.

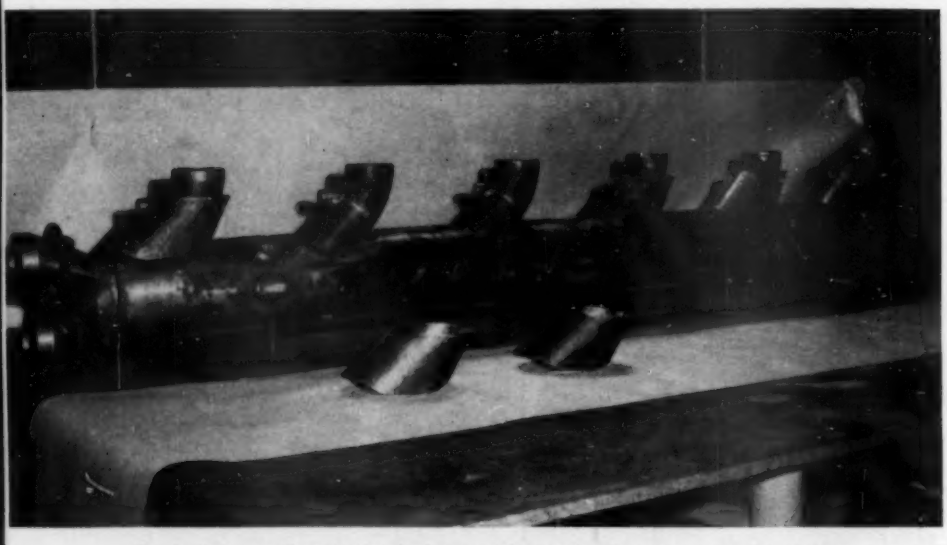


Fig. 3—Exhaust elbow jackets have been fabricated and are now ready for welding.

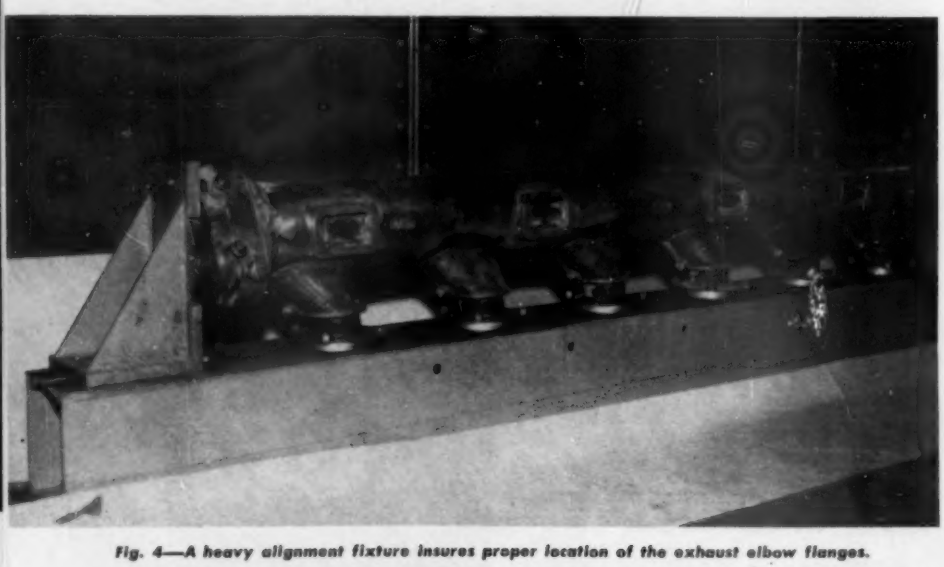


Fig. 4—A heavy alignment fixture insures proper location of the exhaust elbow flanges.

Internal Separator

Primarily, the manifold consists of a number of tubular bodies, made from pipe or formed sheet, with spacer lugs inserted between their respective walls to keep a uniform distance between them. The assembly is started by welding a ½ in. pipe and a ½ in. sleeve nipple to a cover of 2½ in. diameter. This unit is then placed inside a 2½ in. pipe, as is shown in Fig. 1, to form the internal heat exchanger of the manifold. The cover plate is welded over an end of the before-mentioned 2½ in. pipe. The smaller pipe extends nearly to the end of the larger one and serves as a water intake, while the nipple provides the outlet for the heat-laden water.

This illustration (Fig. 1) also shows the two helical vanes tacked in place on the exterior of the 2½ in. pipe. It is the purpose of these vanes to keep the gases exhausting from any cylinder from interfering with a similar process in another cylinder since the exhaust strokes of any multicylinder engine inevitably overlap. The vanes are, in fact, the real secret of the successful operation of the "Helixhaust" manifold. They are made by joining six pieces of ¼ in. by 2¼ in. bar stock: four straight pieces about 4 ft long and two center pieces about 2 ft long. The shorter pieces are formed by twisting to the required helix so that the vanes are rotated through 120 deg (in this case) between the two ends of the manifold.

The two vanes are spaced 180 deg apart. In assembly, they are first tack welded in place and then subsequently welded for their entire lengths. After the vanes have been welded to the 2½ in. pipe, a jacket is placed over them as is shown in Fig. 2.

Multipiece Jacket

The exhaust pipe outlet jacket is fabricated by welding together five pieces. Its multiple-piece construction makes it possible to weld the outer edges of the vane to the inside of the jacket. This is highly important because the welds along the Helix vanes between the inner tubing and the outer casing must be sufficiently tight to withstand a hydraulic pressure test of 80 psi. The seam welds in the outer casing must naturally be capable of withstanding the same pressure.

The next step is to weld spacer lugs between the outer jacket and the exhaust outlet pipe. The space between these shells forms a circulating water passage, which prevents heat radiation into the engine room and

also reduces the temperature of exhaust gases led to the turbine. The lugs may be seen in Fig. 2 as well as the six exhaust elbows connecting to the engine cylinders.

Exhaust Elbows

The exhaust elbows are welded into place at the same time as the spacer lugs. Each elbow consists of a short piece of pipe welded to a 45 deg welding fitting. A nipple, which is used for inserting a thermocouple, is welded to each elbow.

The manifold assembly is now ready for its outer jacket (Fig. 3), a 10 in. OD pipe. This pipe is split into two halves and flame-cut to provide openings for the exhaust elbows. Slots are also flame-cut to correspond with the location of the spacer lugs, to which the outer casing is plug welded.

Each exhaust elbow is now provided with a formed sheet steel jacket having the appearance of a truncated cone. These sleeves are also shown in Fig. 3. All of the exhaust elbow jackets have been fabricated and four of them are in position for welding at the stage of work depicted in this illustration.

Fig. 4 pictures the alignment fixture employed to make the final welds of the flanges to the six exhaust elbows. This fixture is a replica of that portion of the diesel engine on which the manifold is to be mounted.

Very Small Tolerances

For such a complicated weldment, it hardly seems possible to maintain the extremely limited tolerances to which we have to work. The permissible tolerance is only $\frac{1}{16}$ in. for the overall distance from the front of the machined casting with the ring grooves (left of Fig. 3) to the last elbow. A tolerance of but 0.003 in. is permitted between the exhaust elbows. A tolerance of plus or minus 0.002 in. is allowed from center to center of the ring-groove casting outlets. This is precision welding with a vengeance.

The finished manifold is shown in Fig. 5. Fig. 6 pictures the manner in which it is finally mounted on one of the large Busch-Sulzer diesel engines.

The success of welded fabrication is exemplified in this instance by the fact that the Flori Pipe Co. has been granted contracts for a large number of these manifolds by firms throughout the United States and is now making them on a production basis. This manifold is just another example of the outstanding service which welding and flame-cutting are rendering on the production front.

Fig. 5—The manifold is now complete except for the machining of the cleanout castings and drilling of the exhaust elbow flanges.

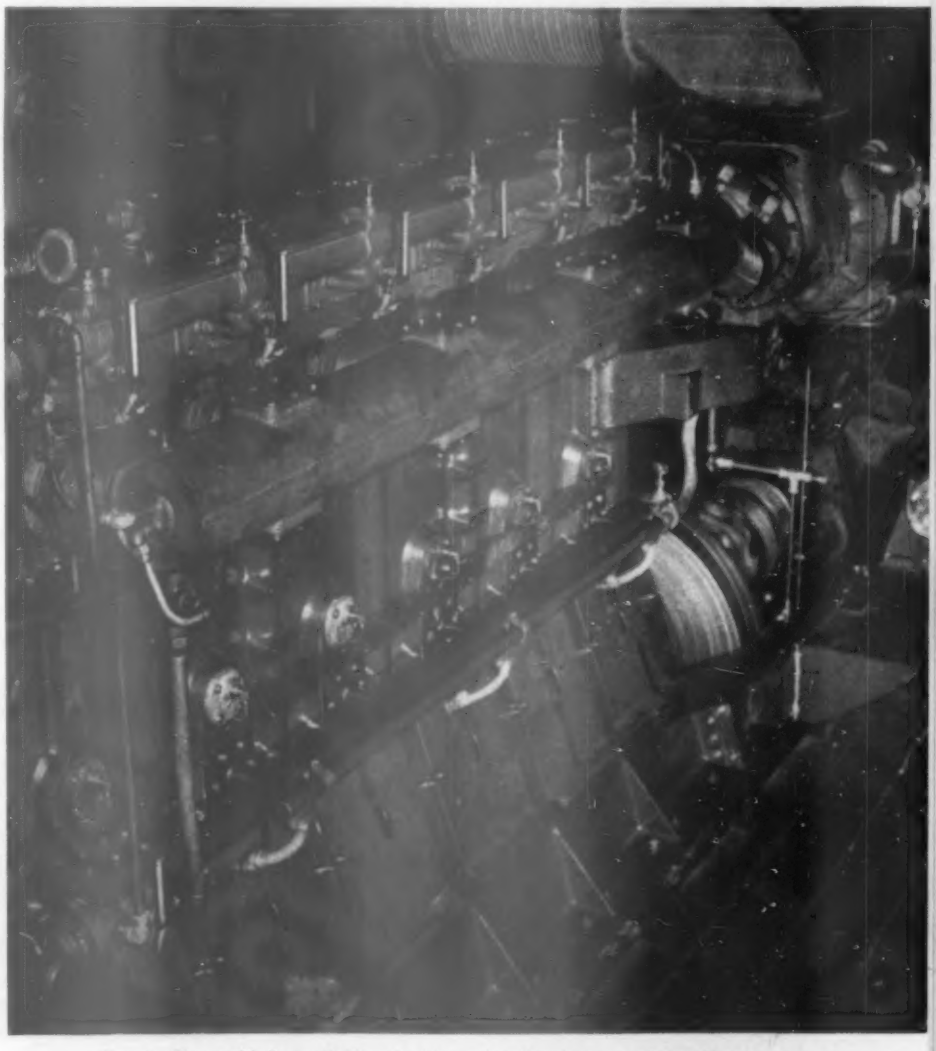


Fig. 6—The welded manifold assembly and turbo-charger unit as they appear when mounted on a diesel engine. Note the simplicity and compactness of the unit.

★ PRODUCTION

Beveling Tube Intersections

Northern Ordnance Incorporated has designed a special flame-cutting machine that will cut a true cylindrical intersection and leave a beveled edge in the tubing.

By **T. B. JEFFERSON**

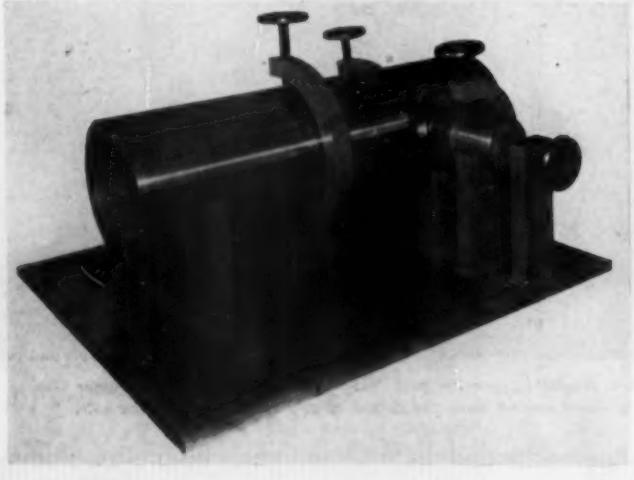
MACHINE flame-cutting of a beveled cylindrical intersection in a piece of thick-walled pipe or tubing has long been considered an impossibility. It is just one of those things that can't be done! Doing the impossible, however, has become part of the daily routine of many of our nation's war production plants.

Northern Ordnance Inc., Minneapolis, is no exception. To prove it, the welding engineers of this organization have designed a flame-cutting machine which will cut a circular hole and leave either a straight or beveled edge in the pipe or tubing. This machine is pictured in Fig. 1. Power is provided through a variable-speed motor and reduction gear. By means of cranks used to obtain reciprocal motions and a chain drive used to rotate the torch, it becomes possible to do the impossible.

Fig. 1—Machine flame-cutting a beveled hole in a piece of heavy-wall tubing.

Trunnions to Tubes

The problem of flame-cutting a hole in a tube first assumed importance in connection with the production of ordnance parts that were being made by welding forged cylindrical trunnions to each side of a heavy-walled tube. These trunnions have a common axis which intersects the axis of the tubing at right angles. They were forged with a flange on one end. This flange, which matches the contour of the tube wall (see Fig. 2), locates the weld joint so that X-ray inspection of the weld can be made without interference from the body of the trunnion. Since inspection requirements did not permit any defects, a grooved joint was mandatory. A method had to be developed, therefore, to bevel the parts to be welded.



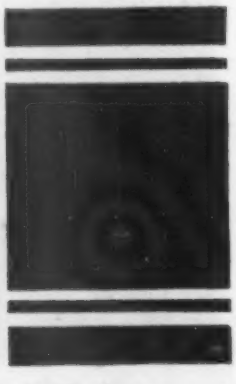


Fig. 2—Both tube and trunnions have been beveled and are assembled in a tacking fixture.

Cut Egg-shaped Holes

Company engineers quickly determined that this beveling operation could become a first-class production bottleneck. Doing the job by manual flame-cutting was always slow and often inaccurate—incorrectly beveled and egg-shaped holes would be the almost invariable result. To obviate these difficulties, the market was investigated to see if a machine that could do the job could be purchased. It could not. The only such machine available was manually operated and did not appear to be able to handle the job satisfactorily. It was decided, therefore, to design an entirely automatic bevel-cutting machine.

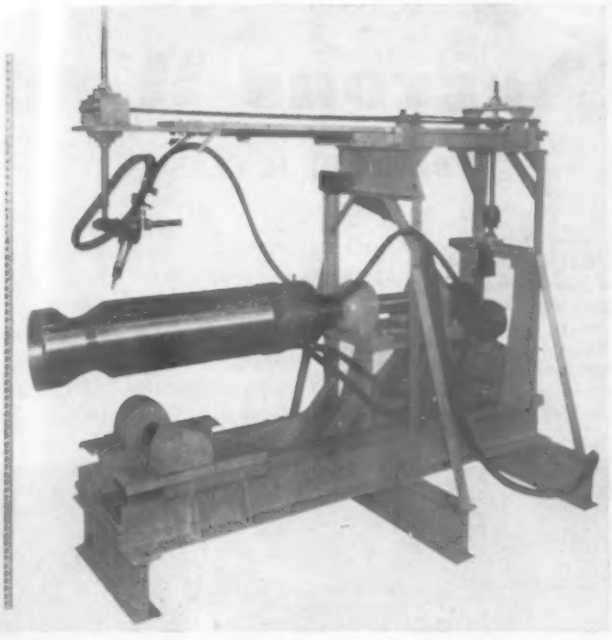


Fig. 3—The finished beveled holes have been flame-cut on both sides of the tubing, which is now ready for the stubs to be welded on it to form required trunnions.

shaft leading from the reduction gear.

In order to prevent the gas hoses from coiling about the torch spindle, it was necessary to reverse the direction of operation of the torch on each cut. A reversing type of control is therefore used with the driving motor. The upper structure carrying the torch is able to retract without affecting the adjustment of the machine, greatly simplifying loading and unloading.

The matching bevel on the trunnion forging is cut on the same machine; it is only necessary to change the adjustment and to use a different chuck.

This extremely ingenious tube or pipe-cutting machine is just one more example of the production miracle that is now overwhelming Axis sea, air and land power. American ingenuity simply cannot be beat, not even by Teutonic thoroughness or ruthless Jap cunning.

The Finished Machine

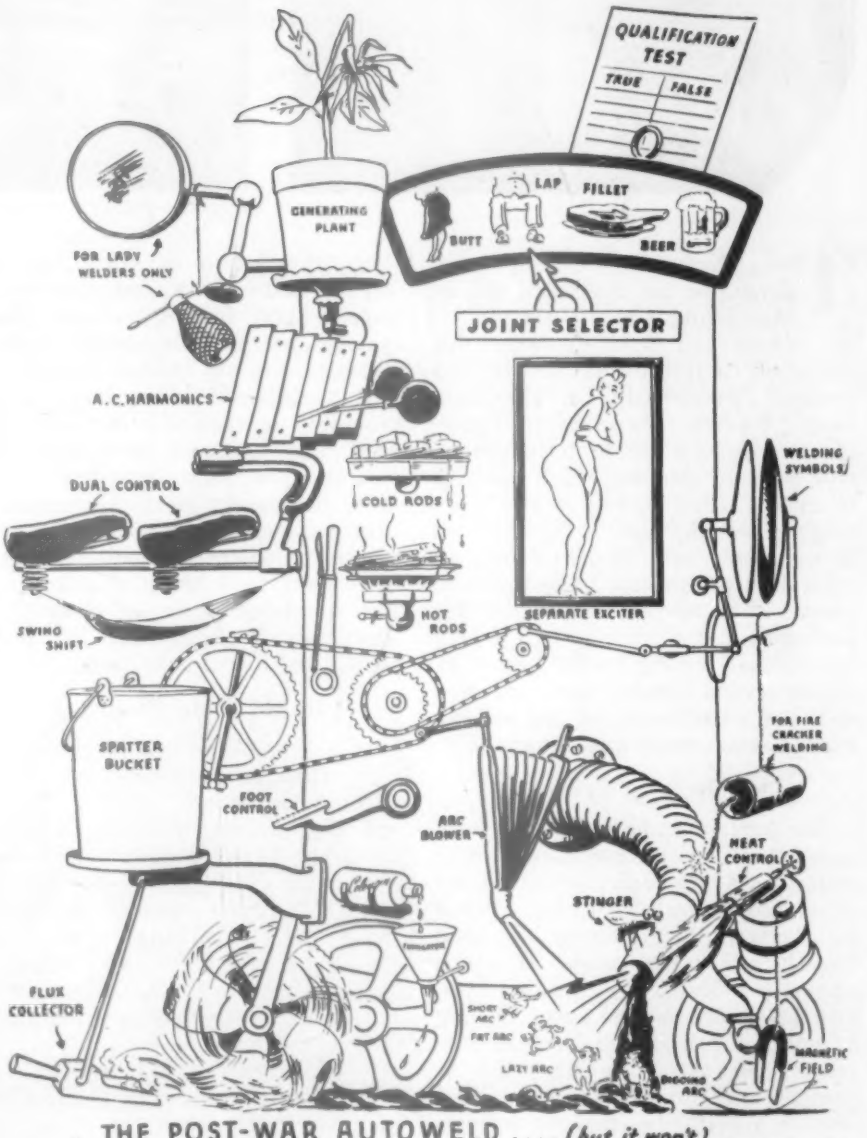
The resultant machine (as well as one of the bevels it is capable of cutting) is shown in Fig. 3. This machine is able to handle tubing ranging from 3 to 12 in. in diameter and to cut holes with either inside or outside bevels.

The set-up of this machine is extremely simple. It is only necessary to set the throw of one crank to the tube radius, the throw of the second crank to the hole radius, and the torch to the bevel angle. All of the settings are direct, requiring no calculations or use of factors or tables. Inasmuch as a true circle is required at the root of the groove, the inside radius of the tube is used for setting the crank for an outside bevel. Conversely, the outside radius of the tube is used when an inside bevel is desired.

Unlike most cutting machines, this machine moves the work under the torch. Far from being stationary, however, the torch rotates 360 deg in a plane, which movement is necessary in order to produce the bevel.

Three Motions Synchronized

The tube is held in an air-operated chuck, which turns through the angle subtended by the hole diameter and then back again. The chuck is mounted on a carriage which moves back and forth on rails, covering a distance equal to the diameter of the hole. Both the chuck and carriage motions are synchronized with the rotation of the torch so that all three cycles of motion occur simultaneously and are so related that the torch cuts along a circular path. The driving mechanism is surprisingly simple: all motions are accomplished by a single



THE POST-WAR AUTOWELD .... *(but it won't)*

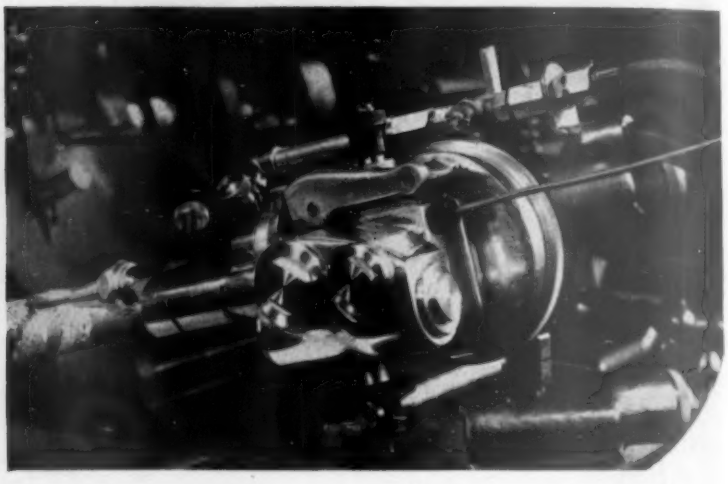
Courtesy, The Lincoln Electric Co.

"Nervous Weld" Pr

By CLYDE B. CLASON

The Nervous Weld machine is a low voltage, high amperage unit with one-dial control. It is used in connection with a pistol, which acts as a vibrating air hammer to forge the deposited metal. The left illustration shows the equipment being used in the repair of a cracked motor block.

steel castings; repairing cracked engine blocks; sealing water jacket cracks; adding metal to internal and external diameters for press-fit applications; effecting dimensional changes in an aluminum pattern, adding bosses or fillets to a pattern, etc.



Power chamber of the Nervous Weld pistol is attached to the turbine of a metallizing gun for the automatic feed of welding wire. In the preparation of a surface for metallizing, it is said to increase bonding speed by as much as 500%. The pistol requires about 4 to 5 cfm of air at 40 to 60 psi.

THE "Nervous Weld" process, developed by engineers of the Metallizing Co. of America, is the newest tool to be developed for the repair of ferrous and non-ferrous castings, particularly for aluminum casting repairs. The necessary equipment includes a special transformer-type welding machine which operates on either 110, 220, 440 or 550 volts, single phase, a-c, and a pistol which is operated with approximately 5 cubic feet per minute of compressed air at 40 to 60 psi. The pistol has feed rolls and a trigger arrangement for manual feeding of the electrode. An air-cooled nozzle is also provided so that the part being welded will not reach a temperature exceeding 125 F.

A Vibrating Process

The surface to be repaired is contacted with an electrode of similar material, which may be of either aluminum, bronze or nickel. When in contact, the electrode is soon heated to a plastic state, at which stage the vibrator (the pistol) automatically pulls the rod away, leaving a "gob" of plastic metal on the surface. The recoil of the vibrator pounds and forges the new metal until it actually becomes an integral part of the parent-metal structure. Thus the action of the "Nervous Weld" pistol is a combination of welding and forging. As a consequence, it is possible to apply a very dense, uniformly bonded deposit.

A nickel rod is used for steel, gray iron or malleable iron castings. With this there will be a slight discoloration of the deposited metal from the parent metal. For bronze castings, a special bronze electrode of low zinc content is used, and there will again be a slight discoloration. For aluminum castings, however, an aluminum electrode which is a near-perfect color match is used.

Rapid Hole Plugging

It is possible with this process to plug holes in aluminum and obtain a permanent bond; in fact, the result is an actual fusion. Large or small holes can be filled quickly and effectively. The process can also be called a "putting on" tool. It differs from the metallizing process, it should be noted, in that a homogeneous bond is obtained instead of a mechanical bond caused by interlocking particles.

The "Nervous Weld" process has a number of practical applications such as plugging holes in aluminum, bronze, gray iron, malleable iron and

Unquestionably, one of the most important uses of this process is in the salvaging of defective aluminum castings. The fusion is so perfect and the deposit is so dense at the point of fusion that there is no apparent line of demarcation. It is stated that the deposit is within 1% to 1½% maximum of the density of the cast aluminum. Even photomicrographs will fail to show up the fill-in or the line of demarcation.

Let us cite a few actual examples of the use of the "Nervous Weld" process:

Bombsight Castings

A midwestern manufacturing plant turning out bombsights had a great many rejects on aluminum castings. Other methods had been used to fill up the blowholes and low places on the aluminum alloy castings without success. The best method had been to use a low-temperature zinc alloy rod and plug the holes by welding and brazing; this

Process

The expressive term "Nervous Weld" doesn't refer to the uncertainties of the greenhorn weldor. It is a brand new type of welding developed to plug blowholes or otherwise add metal to salvage castings—particularly aluminum.

method was not satisfactory, however, because the repair would not stand alumilite plating. The joints would open and in many cases lift up as a result of the action of the sodium hydroxide solution used to pickle the casting for the plating process.

Three castings, each one representing an average cost of $75 for machine work and with two or three blowholes in each, were salvaged by Nervous Welding. The holes were filled with new aluminum, and when the repaired areas were machined it was impossible to detect them. At no time did the temperature of the area being prepared rise above body heat. These parts alumilite plated perfectly.

Core Box Difficulty

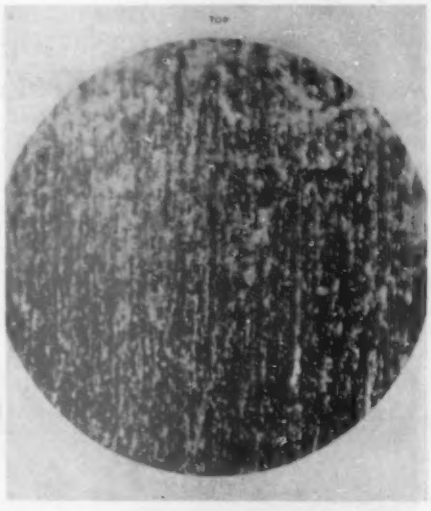
Another example is a midwestern foundry that was running at 75% capacity because of a big bottleneck in its core boxes. As sand is projected into the core box, it hits the target areas at a velocity sufficient to form a hole the size of a 50c piece and from ¼ to ½ in. deep. As these holes get deeper, the resultant core changes mean that less metal is added in some places to the casting. In order to maintain uniform thickness of the castings, therefore, girls employed as molders had to perform extra operations to form out the core molds. A crew of pattern makers was then employed to rework the target areas in the core boxes with steel or brass. This is a very slow and expensive process as no heat can be applied which would throw the molds out of dimension. Each area takes an average of six hours' labor, and the reworking is not too satisfactory as the surrounding area (where the bond is made) will work away again in a short period of time.

Five core boxes with an average of three target areas in each were prepared and completed for service in 4½ hours with the Nervous Weld pistol. A time study estimated that this would have taken 9½ days of labor under the old method. Further tests have shown that it is possible to use a nickel electrode to armor these areas satisfactorily.

At the same plant, pattern fillets were also repaired with the "Nervous Weld" pistol. This took only a few minutes as compared to hours of tedious scraping and filing by the pattern maker.

392 Holes

Another foundry turned out four powder loading trays (for cannons) approximately 4 ft long by 18 in. wide. These castings contained almost innumerable blowholes: an actual count in one showed 392 holes with an average diameter of 3/16 in. and depth of ¼ in. If filled in the usual way, these blowholes would have to be drilled out, filled with low temperature metal and then cleaned. This would take about four days per casting. The casting with the 392 holes was finished by Nervous Welding in six hours for the complete job, and the chief inspector could not find a trace of a single hole.



Photomicrograph showing 69-diam cross-section enlargement of aluminum Nervous Welded (top) to aluminum. The deposit is of uniform density with the parent metal, and no line of demarcation can be observed.

Another casting had a shrinkage fissure about 1 in. long along one edge. This should have been chiseled out, but the operator, misunderstanding the instruction, cut out a wedge throughout the fissure length with a hacksaw. The wedge measured ¾ in. wide and 1 in. long by ¼ in. thick. When this mistake was discovered, the wedge was filled in by Nervous Welding. Afterwards, the inspector took a hammer to test the deposit. Though he pounded it severely with the wooden handle, this treatment did not loosen the bond.

Putting on a New Boss

A Chicago pattern maker had an aluminum pattern on which a boss had been placed in the wrong location. Ordinarily, the mistake could only be rectified by drilling out and removing the boss, leaving a recess hole in the pattern. The hole would then have to be extended to receive the new boss in the new location, and a new pattern would have to be made to provide a plug to fit the hole; then a casting made from the new pattern would be worked to proper dimension and inserted in the prepared hole. Nervous Welding was used to put the boss in the proper place in a few minutes.

Putting a boss on an aluminum pattern. The new process can save much time in such applications.

Building with Steel Tubing

Lower costs and lesser weight are two of the reasons for today's trend towards the use of welded tubing for structural purposes. Pioneers in this field are the petroleum and aircraft industries—both heavy users.

Typical of the ingenuity of the petroleum industry in making use of old pieces of tubing is this framework for holding six square containers of lubricating oil. A quarter segment was cut out of each of the four uprights. The latter were then welded so that their cut-away portions would fit over the tank corners.

SIMPLIFIED designs for the purpose of reducing the cost of welded fabrication are resulting in an increased use of steel tubing in many types of structures. Some interesting examples of this trend are found in the prize-winning papers submitted in the contest sponsored by the James F. Lincoln Arc Welding Foundation. It is significant that the scope of these papers includes every major field of steel construction and that attention is focused on the economic and social gains resulting from redesign involving arc-welded construction because the maximum functional efficiency of tubular members in any structure is best developed through properly designed welded connections.

Oil Field Applications

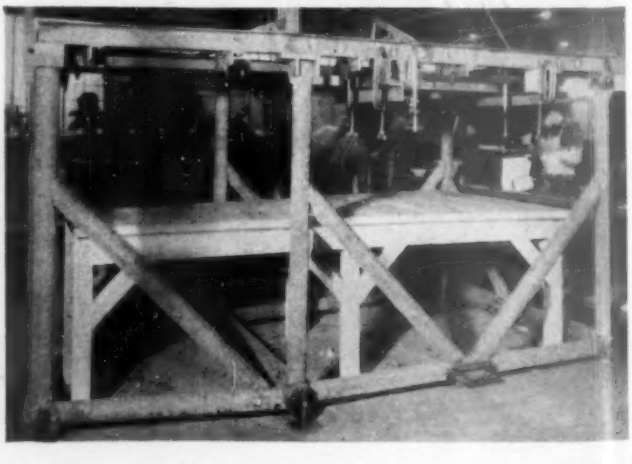
Two industries outstanding in the variety of structural uses found for steel tubing are petroleum and aircraft. The reasons which have motivated their use of tubing are, however, somewhat different. In the petroleum industry, there has nearly always been a surplus of used pipe and tubing in and around the oil fields, available at attractive prices, and these districts were mostly so far removed from the steel mills that the transportation cost on new structural shapes was fairly high. Another favorable factor is that oil field workers are accustomed to fabricating huge quantities of piping for various kinds of flow lines. Hence the cutting and fitting of tube joints present no new problems to their designing staffs or to their welding crews. It is interesting to note that the material used is often much heavier than the loading would theoretically require. This is because the tubes and pipe are selected from available stocks, and the extra weight does not penalize the job from a cost standpoint since the material is purchased at scrap prices.

Typical constructions for use by oil field contractors are described in a paper by X. T. Stoddard, Jr., of the Duval Texas Lumber Co., Orchard, Texas. They include: steam radiators, fences and gates, cab and boom for mounting on a tractor, cement box ore skids, drill pipe rack, watch tower on skids, portable transformer racks on skids, road drags and demountable structural towers. All of these are types of equipment that will find application and use in other industries. The scope of usefulness of tube sections in structures is strongly emphasized by the widely different functions performed in these varied applications.

Aircraft Construction

Preference for the utilization of steel tubing in the construction of platforms, railings, assembly jigs and similar plant equipment is generally based on the high degree of rigidity and the high strength-weight ratio obtained in tubular structures. A frequently mentioned incidental advantage is the decreased hazard that is characteristic of the round tube section, due to the absence of sharp edges and corners.

Tubular construction is preferred by engineers in the aircraft industry because they are confronted with the necessity for obtaining maximum strength with minimum weight. The rigidity which it is possible to obtain in a structure having tubular members is also considered to be an important advantage in many pieces of equipment. Aircraft engineers are familiar with the properties of steel tubing and with the methods of fabricating it. They usually are well



Tubular jigs like this one at Douglas Aircraft Co. offer the advantages of rigidity, a high strength-weight ratio and a minimum of sharp edges and corners to injure workers.

Structural tubing gives the strong, light-weight construction that is needed by the fighter plane. This welder at Carrier Corp. is fabricating an engine mount for a P-47.

acquainted with the properties of thin-wall tubing and consequently often utilize sizes that would seem almost fragile to the layman. In common with the petroleum industry, the aviation industry appears to make increased use of tubular construction as experience with it is gained.

How arc-welded aircraft tubular jigs proved themselves superior to other types of jig construction is related in detail by Richard H. Holmes of Douglas Aircraft Co. The cost analysis comparison given in this paper is particularly interesting because it shows that the completed cost of the tubular jigs is appreciably lower despite the fact that material costs will average about one-third higher.

A comparative study discloses that the time required for fabricating a welded tubular joint, including layout and fit-up time, ranged from 9.15 to 39.35 minutes, averaging 23.14 minutes. Labor costs ranged from 17c to 72c, averaging 43c per joint. Bolt and dowel joints in comparable sizes of flat rolled shapes ranged from 25.25 to 62.73 minutes, averaging 42 minutes. The labor cost per joint ranged from 51c to $1.26, averaging 85c per joint.

Rigidity with Less Weight

An important source of cost saving in the aircraft field is the greater rigidity of the round tube section. To obtain the same rigidity, approximately 4½ lb of structural steel are necessary for each 1 lb of airplane as against approximately 3 lb of tubular steel for each 1 lb of airplane. Over $500 is saved on just one center panel jig (weighing a little more than 10,000 lb) as compared with a bolted and doweled structural steel jig of equivalent size but of additional weight to attain the same rigidity. On this basis, $500 per 10,000 lb equals five cents saved on each pound of arc-welded jig construction.

Another advantage mentioned by Mr. Holmes is that the smooth streamlining of tubular structures with smooth arc-welded joints presents fewer hazards to the workmen. This feature was made the subject of a three months' investigation in one plant. It was found that for every 10,000 man-hours applied on assembly procedure on structural steel jigs (including fabrication) there was a loss of approximately 200 man-hours because of head, hand and other injuries. For every 10,000 man-hours applied on assembly procedure on arc-welded tubular jigs, there was a loss of approximately 60 man-hours because of the same injuries. A saving of 140 man-hours in every 10,000 will amount to a considerable manpower saving in the course of a year.

Savings from Square Tubing

The petroleum and aircraft industries are by no means the only users of structural steel tubing. In a paper that deals with the design and construction of arc-welded motor drives for machine tools, John P. Berkeley of the Berkeley Equipment Co., Corry, Pa., states that drives are often built from structural square tubing and that this method of construction is very inexpensive. Since box sections are already provided in the tubing, the only welding required is that done in butt welding the lengths of tubing together. Structural square tubing has been used on drive units of up to 15 hp. The tubing is about 60% cheaper than a column of the same section fabricated by welding ¼ in. plate.

Advantage may be taken of the natural function of the tube as a container. The redesign of direct-fired unit heaters for space heating in tube mills is the subject of a paper by R. M. Rush and H. A. Pietsch of the Dravo Corp., Pittsburgh. In the original heater, the products of combustion were cooled by drawing them down narrow passages between insulating brick walls and the inner metal casing of the combustion chamber. The new design eliminated the insulating brick and substituted boiler tubes outside of the combustion chamber for the cooling effect.

Tapered Tubular Boom

Tubular booms are commonly used on cargo ships of all kinds. William G. Gerstaker of the Union Metal Mfg. Co., Canton, O., has developed a refinement of tubular construction that utilizes a tapered tubular member. Booms of uniform cross-section, he finds, are unnecessarily heavy towards the extremities in order that they may have sufficient strength at the center where lateral deflections due to load are greatest. Thus there is a weight-saving advantage in the proper proportioning of the boom, which is regarded as a column with central load.

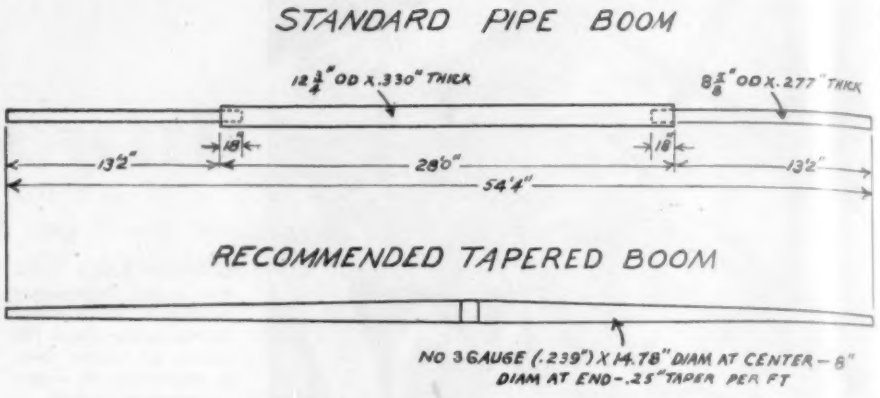
One conventional method is a double telescopic arrangement of tubes having the ends of the larger

Structural square tubing is used by Berkeley Equipment Co. for the fabrication of this small drive for a bench lathe. The lengths of tubing are butt welded together as shown.

elements swaged down to fit the smaller, to which they are welded. Due to the cost of making swaged joints, however, only two or three sizes of pipe are economical to use in making the boom. Thus the stress in the smaller pipe size at a swaged joint and the stress at the center of the pipe boom are critical stress points, and there is, therefore, only a partial reduction of weight.

In the redesign, two seam-welded tapering tube sections were welded into a central splicing sleeve. This gives a nearly uniform stress distribution throughout the length of the boom if a suitable center diameter, material gauge and taper are used. The advantages are: the new design is stronger and has a higher safety factor based on yield point stress; there is better resistance to shock overloads; the tapered boom is cheaper and quicker to build; it weighs less. Estimated cost savings are: 50% in material, 5 to 10% in labor and 50% or more load capacity.

These scattered examples indicate that development work in welded tubular structures with a view to product improvement and fabrication economies would be of benefit to almost any industry.



Standard pipe boom for a cargo ship and the tapered tubular boom that was developed by William G. Gerstaker of Union Metal Mfg. Co.

★

Welded Reinforcing for Concrete Pipe

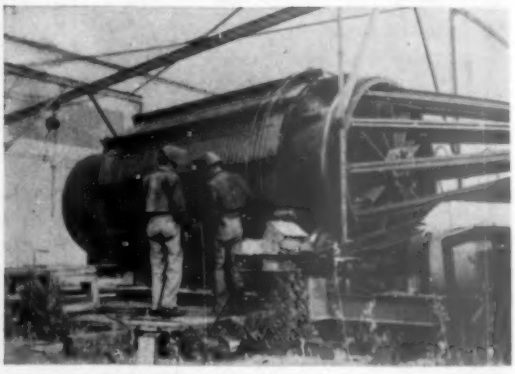
By **WILLIAM A. SHELTON**
American Concrete and Steel Pipe Co.

DUE to wartime conditions, steel pipe could not be obtained for the 106 in. circulating water tunnels needed in the Harbor steam plant of the Department of Water and Power, Los Angeles. Hence it was decided to save war-scarce steel by using concrete piping. Since the latter would not have been strong enough by itself, each big concrete section was reinforced by a skeleton of welded steel.

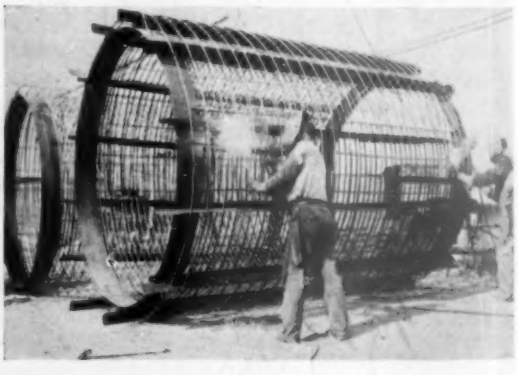
The "cages" shown in the two upper pictures at right were made by winding ⅝ in. reinforcing steel bars on a mandrel and welding them to horizontal spacers. The bar ends were then welded to additional ½ in. horizontal spacers. On the bars used for transverse reinforcement, each weld had to test to 40,000 psi.

The concrete was cast in forms which consisted of an inner and outer steel cylinder, a fabricated metal bottom ring and a steel top ring. In preparation for the pouring, the welded cage was lowered over the inside steel form and the outside steel form was then lowered over the cage. The latter was, of course, firmly embedded within the concrete when it had been poured to fill the space between the two forms.

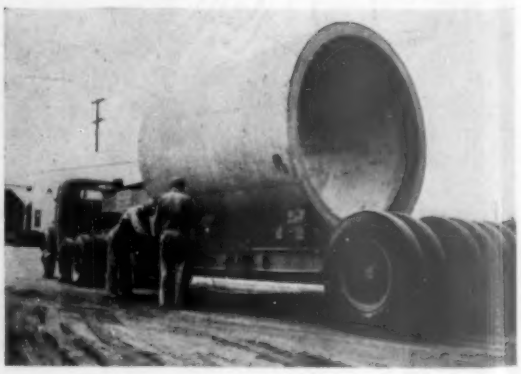
The inner and outer forms were fabricated by welding 8 gauge sheet steel. This thickness (⅛ in.) was sufficient to prevent distortion from the weight of the fluid concrete. All welds had to be water-tight, and the forms had to be made to precise dimensions to assure that the finished pipe would be exactly 96 in. ID and 106 in. OD.



Winding the reinforcing bars on a mandrel. This was the first step in the fabrication of the "cage" shown in center picture.



Welding the reinforcing bars to horizontal spacers after withdrawal of "cage" from the mandrel.



The "cage" is placed between inner and outer steel forms, and the concrete is poured. The result is the finished section, 106 in. OD, shown in the bottom picture. Altogether, 4,976 lineal feet were made of this steel-reinforced concrete pipe, at a total cost of $211,480. Some 491 tons of reinforcing rods and bars were used, at a cost of $30,636.

Photos courtesy, The Hobart Bros. Co.

Stress-Relief Welding

Longitudinal stresses in welded ship plates can be greatly reduced, it is claimed, by a method providing outlets for the escape of stresses.

By **GLENN F. CROSIAR**

WELDING stresses may be controlled by the proper combination of welding sequence, welding procedure and operator skill. If any of these three factors is neglected, the resultant thermal stresses may become so highly concentrated that weld failure will occur. It is believed by many authorities that such stresses (especially when added to unfavorable seas) are directly responsible for the comparatively few failures experienced in Liberty ships. Whether this is true or not, authorities agree that it is desirable to eliminate the stresses which result from the expansion caused by the heat of welding and the consequent contraction upon cooling.

Free Movement, No Stress

Shrinkage stresses are minimized by the employment of a welding sequence that will permit free movement of at least one of the plates, units or assemblies being butt welded. However, free movement is not possible with final welds. It is scarcely surprising, therefore, that it has been found the most serious locked-up stresses are developed when closing welds are made in large assemblies.

The writer has applied for patents on a system of welding and procedure which tend to overcome this difficulty. Highly successful experiments conducted on oil storage tanks prove that the method to be described is an entirely practicable one. This method of producing a welded joint has been approved by the American Bureau of Shipping. The system has not yet been tested, however, upon a structure as large as a ship.

The scheme first proposes that weld joints be laid out so as to reduce stress concentrations. Because of the varying conditions of shipyard welding, it would seem wise to use three different types of joints. These types are shown in the accompanying sketch as methods "A," "B," and "C."

Method "A" is proposed for use on transverse continuous joints such as are encountered in joining large prefabricated sections. This type of joint would be made up of a series of short welds. Each weld is approximately 6 in. in length and makes an included interior angle of approximately 135 deg with each adjacent weld.

For deck seams and other flat joints, a straight weld of the type shown in method "B" may be used. It was this type of weld that proved highly satisfactory in the previously referred to experiments conducted during the building of oil storage tanks. The curved weld joint, method "C," is proposed for longitudinal seams such as shell plating.

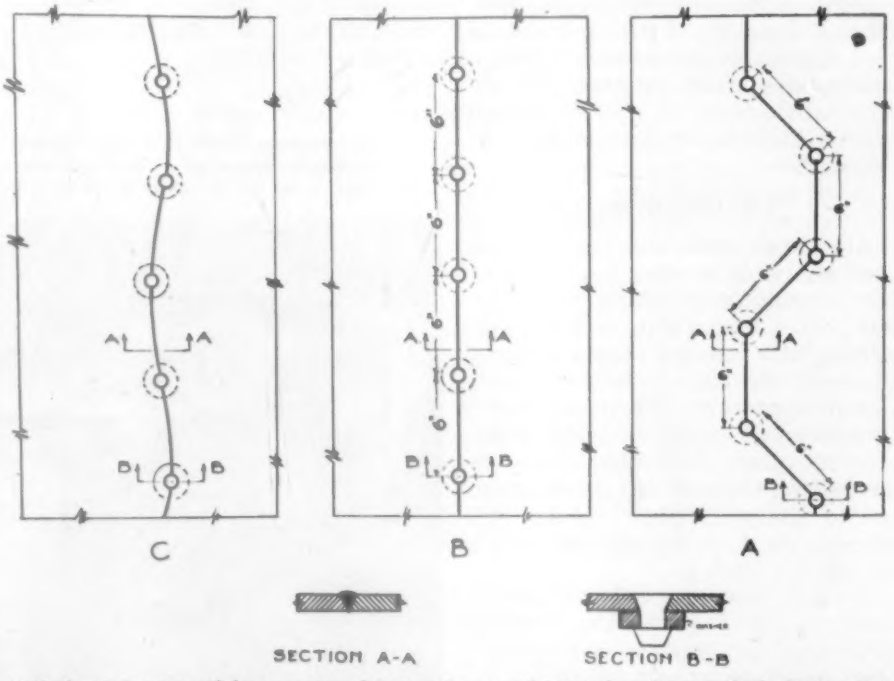
Escape Holes for Stresses

The crux of all of these three welding methods is the use of holes, drilled or burned at appropriate intervals, in order to prevent the concentration of locked-up stresses. Methods "A" and "B" follow the same general procedure. All beveling and preparation is done in the usual manner for butt welded joints. When two sections have been properly prepared, they are aligned and tack welded. Holes approximately ¾ in. in diameter are then drilled or burned at each angular intersection in method "A" and at 6 in. intervals in method "B". Each hole is reamed, both to prevent it from becoming a possible starting point for stress cracks and to obtain the proper bevel for the countersunk rivet that will later fill the hole.

Welding is accomplished by the back step method, welding both ways from the center to the holes. The holes are welded last. After all excess weld metal has been chipped from them, they are fitted with countersunk, driven rivets. Washers are used under the panheads to help make the rivets tight and provide waterproof joints.

Rivets vs. Plug Welding

This method of welding, if properly carried out, will greatly reduce longitudinal stresses. There is also some reduction of stress in the transverse section of the weld, caused by the use of properly driven rivets to close the holes. Plug welds cannot be used for this purpose if ABS approval is desired because of an amendment to the 1944 "Rules of the American Bureau of Shipping for Building and Classifying Steel Vessels" which states, "The use of plug welds should be avoided in so far as practical."



Method "A" is proposed for transverse joints on large prefabricated sections; method "B" for deck seams and other flat joints; method "C" for longitudinal seams such as shell plating. All three methods feature the use of ¾ in. (approximate) holes at 6 in. intervals to relieve locked-up stresses.

Cleaning Aircraft Parts

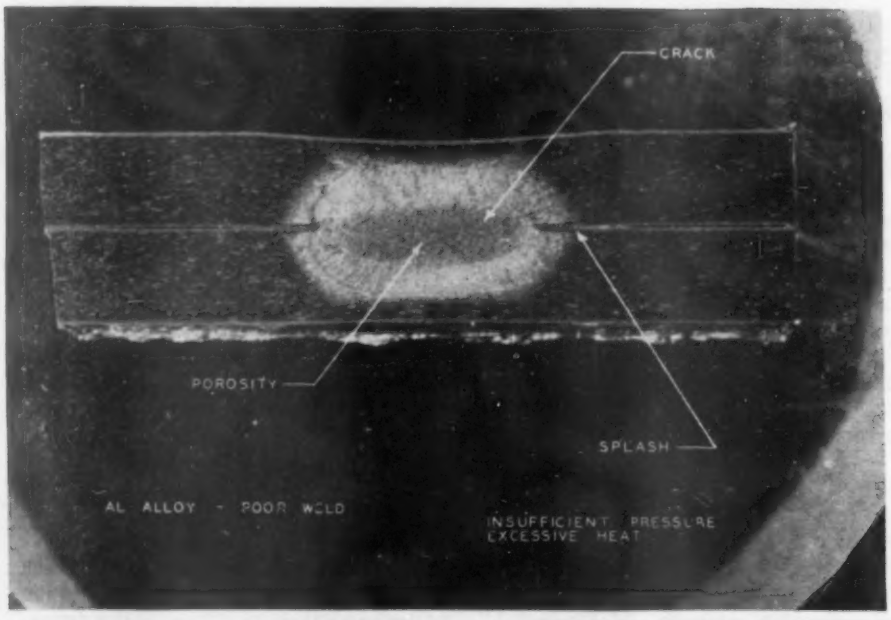


Fig. 1—Enlarged close-up of imperfect weld caused from excessive heat and insufficient pressure.

By **TEMPLE DAVIS**
Douglas Aircraft Corp.

THE manufacture of aircraft calls for many welding operations and presents many problems. This is especially true now that resistance-welding methods have become so widely used as a means of joining aluminum parts. The problem of resistance-welding aluminum has been solved quite satisfactorily by the use of the various types of stored-energy welding equipment developed over the past five years. Even the best and most elaborately controlled resistance-welding equipment, however, will not do a satisfactory job if the material to be welded has not been adequately prepared.

Why Cleaning?

Aluminum and aluminum alloys must always be given a preweld surface preparation treatment. Primarily this is done to eliminate variations in welding heat that are caused by variations in the contact surface resistance of unprepared aluminum sheets. In addition, a clean surface reduces to a minimum the heating between the welding electrode and sheets being welded, lessening tip pick-up and assuring a good surface appearance of the welded sheets.

Surface resistance of the aluminum stock is caused by various foreign substances deposited on the sheets. High purity aluminum, 2S or 3S, is usually received from the producer with fairly bright surfaces so that the only surface preparation required is a degreasing to remove oil, grease, dust and similar foreign material from the weld areas. Both degreasing and deoxidizing are necessary for the aluminum alloys, 17S, 24S, 57S, 53S, 61S and 75S; these alloys carry a heavy oxide coating that should be removed if consistent and satisfactory welds are to be produced. Clad alloys such as 17S-T and 24S-T will also weld much more satisfactorily if cleaned before welding.

It is extremely important that both the mechanical (oil, grease and dust) and the chemical (oxide) films be removed. Any mechanically deposited film such as oil, dirt, etc. cannot be uniform and therefore will generate varying degrees of heat, which in turn will vary the extent of fusion The aluminum oxide film present on aluminum and its alloys is also non-uniform in character. The two films are in no way similar, and different methods of removal are required for each.

Copper Contamination

Spot welding is fundamentally the creation of fusion between inner surfaces of the parts being joined while leaving the outer surfaces comparatively cool. Conditions which would tend to create heat between the outer surface of the sheet and the resistance-welding electrode should be avoided. Since the copper of which the electrode is composed has a tendency to alloy with aluminum alloys at high temperatures, it is highly important that the temperature of the aluminum-to-copper contact remain as low as possible. Then the electrode surface will remain clean and not

Fig. 2—These six tanks and two baskets are used at the El Segundo, Calif., plant of Douglas Aircraft Co. to clean aluminum alloy parts prior to spot welding. The large tank at the far end (left) is the oven in which the parts are dried after cleaning.

Douglas Aircraft has learned a lot about methods for cleaning aluminum prior to spot welding. The results of this company's experiments and production experience in preparing aluminum and alloy sheets are given here.

become contaminated with aluminum or other foreign materials.

It can now be readily seen why all dirt and oxide film should be removed from those surfaces which are to come in contact with the welding electrodes. Proper cleaning insures good surface appearance by minimizing electrode pick-up. It also increases the life of the electrode by increasing the number of spots that can be made between tip dressings.

Unevenly Applied Heat

The oxide film is frequently of such magnitude that a breakdown through it will require an appreciable potential. The result is that the passage of the welding current is sharply localized at a few points. This localized heat condition is likely to result in the expulsion of weld metal from the weld, in weld cavities and in irregularities in the shape of the welds. Thus, if the aluminum parts to be welded are not properly prepared, the resultant welds are likely to be difficult to make, inconsistent in quality and possibly defective in strength. An imperfect weld caused from excessive heat and insufficient pressure is pictured in Fig. 1. While all authorities have agreed that aluminum must be cleaned prior to spot welding or to other resistance welding operations, they are not wholly agreed as to the manner in which the cleaning should be accomplished. In the several different plants of our company, for example, there exist several different methods of aluminum cleaning.

Hydrofluoric Acid Method

The Santa Monica plant uses a hydrofluoric acid etch, which they say is simple and rapid. This is a five-step method: four cleaning steps and a final drying operation. The first four steps of the cleaning are handled in four different tanks of about 1,000 gallon capacity each. These tanks are in a straight line with the drying oven, and the crew uses an overhead crane and Monel baskets to lift the alloy parts from one tank to the other.

The first tank contains a hot 6% soap solution. The alloy parts are lowered into this hot soap solution and left there for an average time of 15 minutes. They then go into the second tank, which contains hot water for rinsing purposes, and are left there for about five minutes. Both of these tanks are constructed of steel. The second or rinse tank has a constant flow of water and is connected with an air hose to create a circulation of water through the tank which rapidly cleanses the alloy part.

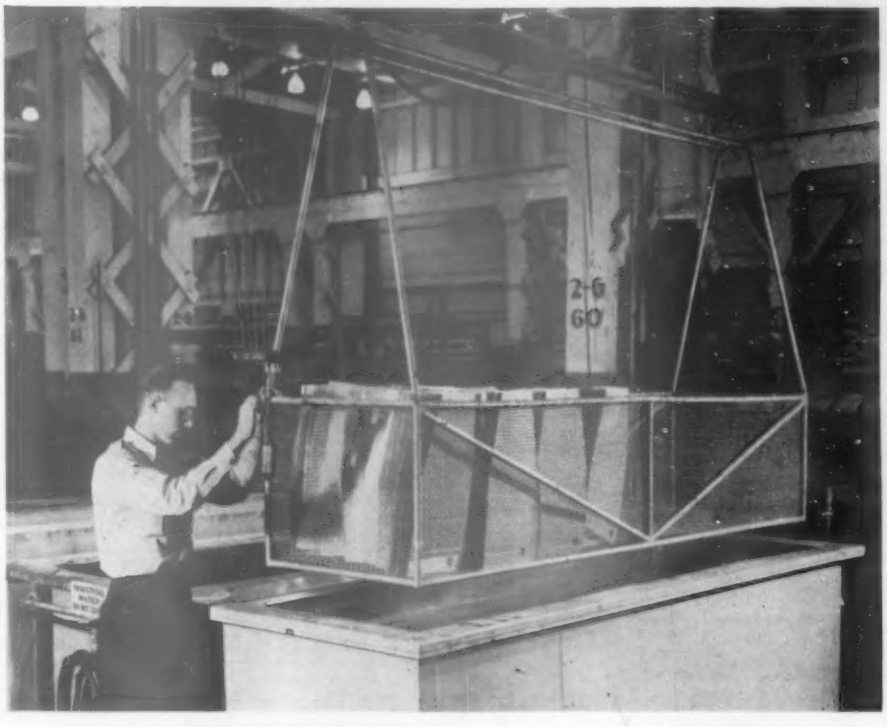


Fig. 3—The aluminum alloys parts in the basket are just about to be lowered into the tank containing the hot sodium acid sulphate etch.

The next two tanks are made of wood. The first wood tank holds a 1% solution of hydrofluoric acid. The parts are left in the hydrofluoric tank from 10 to 30 seconds, depending upon the type of aluminum alloy being processed, and are then lowered into the cold water tank. The latter also has a constant flow of water and a circulating air vent. From the cold-water rinse tank, the fourth and last in the series, the basket moves into a hot air oven where the alloy parts are thoroughly dried.

Sodium Acid Sulphate

At the Douglas El Segundo plant a sodium acid sulphate type of etch material is used. This deoxidizing agent can be readily applied in mass-production systems, and it is believed to offer several advantages over hydrofluoric acid and other etches of this type.

At El Segundo the following advantages are claimed for the sodium acid sulphate type of cleaner: (1) It is relatively inexpensive; (2) it is non-critical for etching time; (3) it is safe to handle as there are no noxious fumes; (4) it may be replenished on the basis of simple titration; (5) it has a low rate of attack on the base metal.

An efficient method of using a chemical-type cleaner is by means of an overhead traveling basket hoist. The stainless steel baskets which serve as conveyors are shown in Fig. 2. They are made to tank size in length and breadth but are about half the net depth of the tank. The El Segundo method requires that all of the four tanks have similar internal dimensions. The conveyor baskets must be carefully loaded, in a manner that will prevent solution entrapment and also prevent blanking off any surface.

Degreasing First

Cleaning is started by immersing the basket in a hot (180 F) alkaline cleaner and allowing the parts to soak for eight minutes. This is the degreasing step, and it insures thorough removal of the mechanical films. The

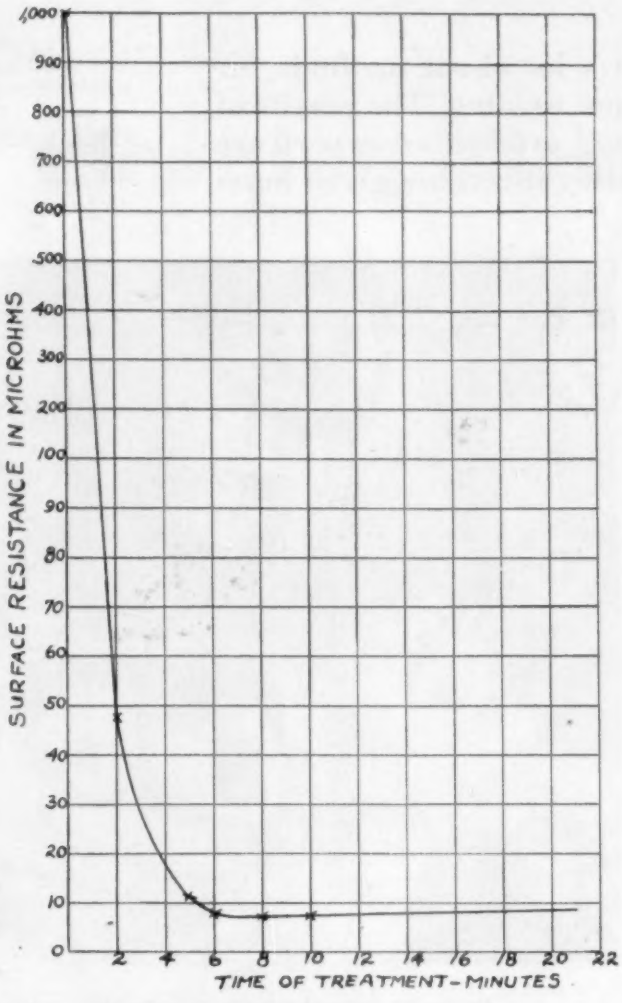


Fig. 4—Surface resistance vs. time of treatment for 0.040 in. 24 ST aluminum sheet. The optimum time in which the load should be left in the hot sodium acid sulphate etch is approximately eight minutes (ten for 61S and 75S). Data furnished by the Diversey Corp., Chicago.

part-laden basket is hoisted and allowed to drain for a brief period before it is immersed in a tank of hot water to rinse. Continuing along the craneway, the basket is next immersed in the tank containing the hot (180 F ± 10 F) sodium acid sulphate etch (Fig. 3).

The dry ingredients of the etchant are mixed prior to solution. Four ounces of mix per gallon of water are needed, making the cost of a batch approximately 4 cents per gallon. Replenishment may be made on the basis of a periodic titration test for approximately six weeks; after this time, however, the solution should be dumped and replaced if it is dirty.

Fabricating the Tank

The tank used to contain the hot etch must naturally be resistant to attack by this acid material. A satisfactory tank was fabricated of boiler plate and lined with 18-8 columbium-stabilized corrosion-resistant steel. (A stainless-clad steel would also be excellent for this application.) The liner used need not be more than 1/16 to 3/32 in. thick and may be fabricated from sheet stock, arc or torch welded. The welding has to be done carefully at these seams since any porosity might develop into leaks when the hot acid removes scale from the surface of the weldment. A columbium-stabilized electrode or welding rod should be used.

The acid may be heated by means of electrical immersion heaters, steam pipes or by a gas-fired U-tube heater duct. Gas heating is the simplest and most economical where gas is available. Whatever the heating system, it should be thermostatically controlled in order to maintain the etchant liquid at the proper temperature of 180 F ± 10 F.

Any ducts or heaters immersed in the acid must be made of 18-8 columbium-stabilized stainless steel. An acidproof gasket material should be used to seal all flanges of heater ducts at their points of exit from the tank in order to prevent tank corrosion and minimize the chance of leakage.

Etching Times

Fig. 4 shows how the surface resistance (microhms) varies with the time of treatment for 0.040 in. 24 ST sheet. The load is normally left in the hot sodium acid sulphate etch for a period of approximately eight minutes (ten is optimum for 61S and 75S). If clad 24S, 61S and/or 75S materials are included in the same batch, we use ten minutes etching time as the clad 24S will not overetch. If bare dural (24S) is included in the batch, we use eight minutes as the 24S will turn black if left overtime. After etching, the parts are cold rinsed in the bottom of the fourth tank, which has an overflow outlet at half height; they are then hoisted above the water level and thoroughly spray rinsed. The basket is then placed in a drying oven for approximately ten minutes at 140-150 F.

Care should be taken to do the etching just as soon as possible before spot welding. The parts will start immediately to reoxidize and will eventually reach the same condition as before etching. The El Segundo plant found that there is a 25% reduction in the number of spot welds possible between electrode dressings if the etched parts are allowed to stand for 18 hours before welding. If they are left for 48 hours, there will be a 50% reduction. Apparently, it is best to feed the work directly from the cleaning system to the spot-welding machines. Fortunately, the large capacity and speed of the system makes it unnecessary for us to etch far ahead.

Handle with Gloves

It is recommended that the degreased and deoxidized parts be handled only with clean cotton gloves since fingerprints will contribute to bad welding conditions. No polishing with steel wool is required as the parts come out bright and clean from the final rinse tank.

In production at El Segundo, it has been found that this particular etch gives from four to six times the number of spots per electrode cleaning as did the hydrofluoric-chromic acid etch previously used. Without refrigerated electrodes, from 200 to 300 spots are being obtained on two 0.040 in. thick sheets of clad 24S-T, using an electromagnetic stored-energy type of welder and running 60-70 spots per minute. This number of spots (200 to 300) is sufficient for an average large assembly, and considerable time is saved by being able to run all of the spots needed on a large assembly without stopping to dress the electrodes.

It is our belief that no particular end will be gained by using a refrigerant when 200 to 300 good welds can be obtained by a proper etch. With refrigeration, some 1,000 to 2,000 spots per cleaning are possible, but this is only of theoretical value as most operators will clean their electrodes between large assemblies regardless of the condition, just to be certain that the part will not have to be taken out of the machine for an intermediate electrode dressing.

Skip Welding Thin Stainless

The problem was to prevent buckling and warping of 1/16 in. thick stainless steel sheets used in the fabrication of a cowl 12 ft in diameter. The only sequence proving successful is detailed here.

By **JOSEPH S. WRIGHT**

A WELDING job I recently completed would ordinarily have been considered unmanageable. This consisted of fabricating a cowl of 1/16 in. stainless steel. The cowl was over 12 ft in diameter, and the specifications required all-welded outside seams. The plates were lapped as shown in detail A. Holes were drilled at 10 in. intervals, and bolts were inserted to pull the plates tightly together. The problem was to prevent buckling and warping.

The Way We Did It

Three men were needed to work on this job. A boilermaker and I worked on the outside; another boilermaker worked inside. I commenced welding at a point in the middle of the sheet (see "Starting Point" in the sketch) and welded only two inches along the seam (see section marked 1), using a 1/16 in. 25-20 stainless steel electrode.

The moment I broke off the arc, the boilermaker inside put a buckling bar at the point where the weld commenced, shown by point X on detail 1. The boilermaker on the outside gently peened the weld, starting at point X and moving along the bead to point Y. Peening was done to stretch the weld while it was hot; the weld could not be allowed to contract when it cooled, or it would warp the entire sheet.

Skip Weld at Bolts

The first weld was peened until it was cold. I then welded another two inches, starting at the far side of the first bolt to the right at the section marked 2 on the illustration. The same peening procedure was repeated the moment I broke the arc.

I skipped to the next bolt and welded two more inches at the section marked 3. Section 4 was then welded in a similar fashion, and this brought us to the end of the sheet.

We went back to the middle and worked around to the left, starting on the right side of the first bolt to the left and welding two inches at section 5. In a similar fashion, we worked down the left side, skipping from 5 to sections 6 and 7.

Having finished the left side, we started at the center again and went down the right side. I struck my arc at the end of the little bead in section 1 and welded the two inches of section 8. I repeated this process for sections 9, 10 and 11; then we went back to the center and worked toward the left at sections 12, 13 and 14.

The remaining numbers in the sketch will give the complete sequence, which continued until the seam was all welded at section 28. We then went to work on another seam, using the same sequence and procedure.

Why It Worked

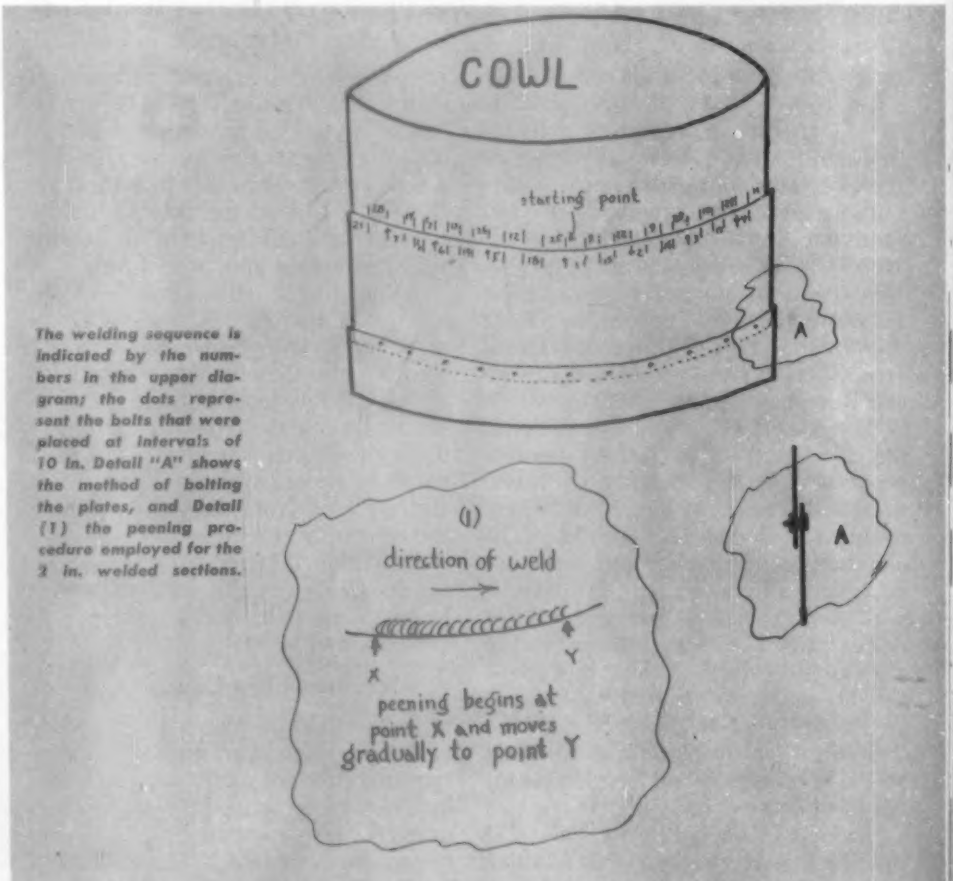
Various other sequences and procedures had been previously tried in the welding of stainless steel cowls, but all of them had failed. Strongbacks and several variations of backstepping had also been used, but in every case the thin stainless steel sheets buckled.

The procedure I have outlined worked for two reasons: first, the hot peening stretched the weld and, second, by skipping around we avoided overheating any one section of the sheet.

Plugging the Holes

After the seams had been welded, the bolts were taken out, and we were now required to fill the holes. Small round disks punched out of a piece of scrap stainless steel sheet were used to plug the holes on the inner face of the cowl. When these disks had been placed, I welded up the holes on the outer face. After this, I went inside the cowl and welded the holes on the inner face. None of these welds were peened.

When finished, all of the welds were ground flush. The cowl then shone as brightly as though it had been pressed out of one piece of stainless steel plate.



The welding sequence is indicated by the numbers in the upper diagram; the dots represent the bolts that were placed at intervals of 10 in. Detail "A" shows the method of bolting the plates, and Detail (1) the peening procedure employed for the 2 in. welded sections.

★ RESEARCH

Welded Ships

Courtesy, The Lincoln Electric Co.

Typical of U. S. shipyards throughout the country is this scene at Seattle-Tacoma Shipbuilding Corp. Without welding, the speed and volume of construction accomplished would have been impossible.

WELDING in ship construction was given a definite boost in an interim report of a Board of Investigation convened by order of the Secretary of the Navy to inquire into the design and methods of construction of welded steel merchant vessels. This report was signed by Rear Admiral Harvey Johnson, Rear Admiral Howard L. Vickery, Rear Admiral E. L. Cochrane and David Arnott, chief surveyor of the American Bureau of Shipping.

The use of welding in lieu of riveting, the report began, had an immediate appeal to the designer of Naval vessels because it offered a direct means for saving hull weight. The elimination of plating and structure represented by seam laps, butt straps and faying flanges, necessary for rivets, was obvious and direct. On a given ship displacement, this saved weight could be devoted to battery, armor or other military load. The limitations on displacement imposed by the Washington and London Naval Treaties became impelling incentives to make use of light materials and welding to save weight so that a larger proportion of displacement could go into military load. The superior behavior of welded structure in way of explosion forces also became apparent. These advantages made it natural for the Navy to lead the way in the application and development of welding tools, materials and procedures.

Although the advancement of the use of welding from the lesser to the more important elements of Naval ship structure could not be scheduled ahead of the technical advances in welding, progress from the early '20's up to the present time has been fairly uniform, necessarily conservative and entirely free from disastrous failure. Large combatant ships still contain a considerable number of riveted connections in carefully selected joints, however, and the end of riveting is not yet in sight.

Merchant Ship Construction

In the field of merchant ship construction, there is an economic incentive to produce ships with lighter hulls—made possible by welding—because the displacement devoted to cargo can be increased. The additional advantages of tightness of structure and lower maintenance cost are also realized. Nevertheless, the character of marine risks has created a powerful conservative force against change. Until about 1936 the application of welding to merchant ship construction was almost entirely limited to small ships and barges. From 1936 to the beginning of the war, moreover, the welding of large ships was not widespread.

It is interesting to note that even before 1936 a few pioneers in welded merchant ship construction advanced much farther than the Navy in capitalizing the advantages afforded by welding. These advantages were in the direction of shop and slab welding of large subassemblies and in the use of automatic welding.

War expansion of shipbuilding facilities brought into existence many completely new yards. It was accepted that welding methods, design and performance had developed to the point where completely welded ships were practical and fast to build. Equipping the new yards primarily for welding—with reduced fabricating tools, air compressors, piping systems, rubber air hose and pneumatic tools required for riveting operations—was an important factor in the relief of manpower, toolmaking capacity and in time. These considerations influenced the decision to accept the welded hull for large merchant ships.

The classification societies and the Bureau of Marine Inspection and Navigation reached the conclusion that the experience already gained with welded hulls was sufficient to warrant the extension of the practice without undue risk. Experience has shown that the war program of merchant ship construction could not have been accomplished *on the necessarily large scale* if the advantages of welding had not been utilized to the fullest extent.

At the same time, the Navy also realized that the usual practices of shipbuilding would have to give way to line production methods. Complete welding was the natural answer to this demand. The resulting all-welded

Okayed!

Courtesy, U. S. Maritime Commission

A Navy board appointed to investigate the design and methods of constructing welded steel merchant vessels gives welding its outstanding approval. Poor loading and ballasting, heavy seas and low temperatures were found to contribute materially to structural distress.

vessels of the landing craft and destroyer escort programs paralleled the small all-welded merchant vessels in having outstandingly successful performance.

Some Ships Failed

In contrast with the performance of small Naval and merchant craft, the larger merchant vessels have experienced, in certain cases, some structural difficulties resulting in fractures in the plating. On the basis of authenticated reports received on a representative group of 2,993 ships, fractures have occurred after launching on about 577 occasions to 432 ships up to April 1, 1944. A large proportion of these were minor in character.

In about 95 ships, the fractures were potentially serious in that they extended well into the ship girder. Twenty vessels have suffered complete fractures of the strength deck, and of these five have completely broken in two. Two of the complete fractures occurred on vessels still at the builders' yards prior to the vessel's being placed in service. Both of these vessels and one of the others which suffered a complete break after being in service have been repaired. Four of the vessels which suffered complete fractures of the strength deck were abandoned so that only six vessels can be said to have been definitely lost to service from structural failures.

No Lives Lost

No lives have been lost as the result of structural failures, except in the case of the *John P. Gaines*, where ten persons are missing after successfully embarking in a lifeboat.

Cracking in ships afloat has usually been associated with near freezing temperatures, or heavy seas or combinations of these two conditions. Statistical data for ships afloat are insufficient as yet to indicate definitely the effect of the corrective measures which have been taken. There is other evidence, however, that the incidence of fractures in new vessels while on the building ways has been materially reduced. The statistical analysis shows that practically all fractures originate in discontinuities occasioned by design details and notch effects incidental to imperfect welding.

Contrary to popular impression, hull fractures are not confined to Liberty ships but are shared by other types of vessels.

Design Details

The evidence so far revealed has shown that attention to detail design to minimize notch effects of square corners and other discontinuities, recognized as good practice in riveted ship design, is of even greater importance in the design of welded ships. Improvements in this direction are current in unfinished construction and in all new ship designs. Research is being done at Government and university laboratories to explore the character of notch effect in order to guide the continued refinement of design.

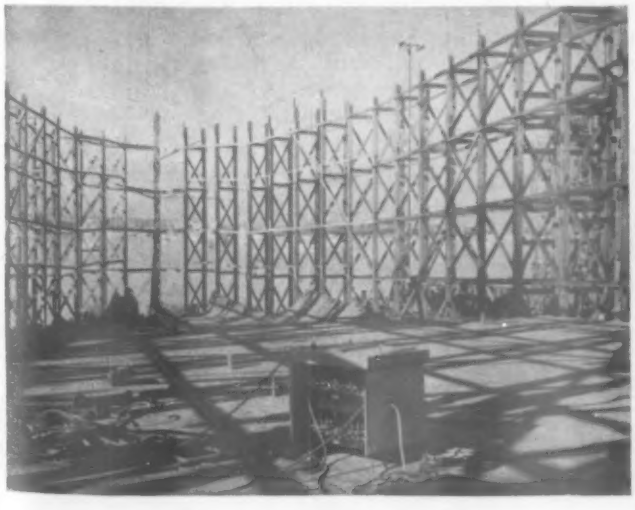
Careful consideration should be given in new welded ship designs to the provision of means for arresting the progression of cracks once they have started. In the case of the Liberty ships, directives have been issued for the installation of four longitudinal riveted joints in the strength deck through the mid-length for this purpose. The work is progressing as rapidly as military considerations permit.

Full scale hogging and sagging tests, coupled with strain measurements, have been made on five ships, one a T-2 tanker and four L-6 ore carriers. The resulting data serve to confirm earlier tests and the generally accepted agreement between calculations (with the assumptions on which they are based) and the actual ship stress. A full scale hogging and sagging test is now being undertaken on a Liberty ship.

Base Metal Satisfactory

Records show that all but an insignificant portion of the steel used in the hulls of welded merchant vessels meets existing specifications for quality. In the few cases where steel has been shown to fall outside the specification requirements, this fact has not been determined to contribute to the fractures.

There is no evidence that fractures



★

Welding the false bottom of a Liberty ship at California Shipbuilding Corp., Los Angeles Harbor. A four-operator 150/200 amp resistor station is used to supply the current to welders.

★

Courtesy, General Electric Co.

in ships afloat have been caused by the inadequate quality of welding electrodes. Despite the pressure of the war emergency the quality and uniformity of welding electrodes have in general been maintained and, in some cases, improved through the coöperation of the producers. Investigations looking toward further improvement are being continued.

Construction Factors

Construction methods and quality of workmanship are major factors in the success or failure of welded hull structures. Recognized good practice has been shown to reduce materially the number of fractures in ships while on the ways. The means of achieving good practice are discussed in general in the following paragraphs:

The planning and execution of procedures and sequences for welded ship construction in conformance with recognized fundamentals of good practice is essential. This planning must cover the ship as a whole as well as the details of its parts. There has been considerable improvement in the attitude of the yards toward planned procedures and sequences since January, 1943, through education and recognition of the serious consequences resulting from unplanned work. Further coördination of the efforts of shipfitters and weldors will contribute to additional improvements.

A sufficient number of competent supervisors, inspectors and workers is essential for the execution of the plan. The number of competent members of these groups has been quite inadequate and the situation does not show any appreciable improvement. Intensive programs of recruitment and training have been largely offset by the rapid growth of the industry, the large labor turnover, the demands of Selective Service and the necessity for high-speed production in the war effort.

Operating Conditions

Military requirements sometimes result in a loading less favorable to the ship with respect to minimizing stresses than normal peacetime practice. The vessels, in some cases, are loaded deeper than in ordinary times and heavy deck loads are not uncommon. Although the amount and distribution of cargo always influences ship stresses, no structural fractures can be traced directly to the character of loading as the primary cause.

Ships, generally, have not been more subject to fractures when in ballast than when loaded. Certain ballast conditions, in association with relatively light draft resulting in comparatively large hogging moments, appear, however, to produce conditions favorable to the progression of cracks once started. Of the 20 ships which have broken in half or sustained complete fracture of the strength deck, 16 were in ballast and two were loaded. The remaining two of the group of 18 which failed at the builder's dock prior to going into service were adversely ballasted, although not abnormally so. Instructions have been issued in the case of Liberty ships to insure a better distribution of ballast when conditions permit.

A large proportion of fractures occurred during conditions of low temperature, heavy seas or combinations of these two conditions. Fifteen of the twenty ships which suffered severe damage were in heavy seas. Convoy operation and other war precautions have resulted in routing large numbers of ships over sea routes through colder and rougher ocean areas than was the case in peacetime.

Specific Investigations

The following projects of inquiry have been initiated and are being pressed to the earliest possible conclusion:

"*(a)* Statistical analysis of steel mill products aimed at assisting the mills to obtain improved and uniform products. This subject is headed by the Bureau of Ships and contributed to by the mills, private and government laboratories.

"*(b)* Research to show the relationship between temperature and notch sensitivity in killed, semi-killed and rimming steels at the National Bureau of Standards.

"*(c)* 'Study of the behavior of steel under conditions of multiaxial stress and the effect on this behavior of metallographic structure and chemical composition.' National Research Project No. NRC-77, which is being conducted by the Armour Research Foundation under the guidance of the War Metallurgy Committee (Navy Project No. NS-307).

"*(d)* 'Behavior of steel under multiaxial stress and the effect of welding and temperature on this behavior.' National Defense Research Council Project No. NRC-75, which is being conducted by the University of California under the guidance of the War Metallurgy Committee (Navy Project No. NS-306).

"*(e)* 'Residual stress in ship welding.' National Defense Research Project No. NRC-64, which is being conducted by the University of California under the guidance of the War Metallurgy Committee (Navy Project No. NS-304).

"*(f)* 'History of residual stresses in welded ship hulls of the Liberty and oil tanker types.' National Defense Research Project No. NRC-74, which is being conducted by the University of California under the guidance of the War Metallurgy Committee (Navy Project No. NS-305).

"*(g)* Experiments in strength of welding, which are being conducted by the Illinois Institute of Technology.

"*(h)* Photoelastic study of various means of hatch corner reinforcement, which is being conducted by the David Taylor Model Basin.

"*(i)* Study of various types of crack arrestor by small scale models, conducted by David Taylor Model Basin.

"*(j)* Crack arrestor study with large models, which is being performed at the University of Illinois.

"*(k)* Weldability of steel for hull construction, NDRC No. NS-255 at Lehigh University."

Summary

Analysis of the fractures indicates the existence of phenomena in welded construction to which a long experience in riveted construction affords no reliable guide. Included are such factors as shrinkage stresses, the behavior of steel at low temperatures and the stress-strain characteristics inherent in the more rigid welded structure. A large number of research projects have been initiated and are now under way in order to determine the relative importance of these factors.

In closing its preliminary report, the Board considered it important to record its opinion that without early and general adoption of welded construction in the merchant shipbuilding program, as well as in the Naval shipbuilding program, the results in speed and volume of construction which have been accomplished would have been impossible.

Facts on U. S. Ships

Deadweight tonnage of American Merchant Marine end of 1941	11,000,000
Deadweight tonnage built Jan. 1, 1942 to April 1, 1944	31,444,300
Number of ships built Jan. 1, 1942 to April 1, 1944	3,052
Number of workers in Maritime Commission yards	616,000
Number of ships under control of War Shipping Administration	3,100
Number of men employed aboard ships (Add 10% shore reserve)	130,000
Long tons of cargo moved out of the United States in 1943	62,000,000

Courtesy, U. S. Maritime Commission.

UNIFORM

When a **Tube-Turn** welding fitting, be it an elbow, a tee, a return, or whatever type, is ready for shipment, it is *ready for good, long, hard service!* Every fitting must undergo rigid checks and inspections to insure uniformity of dimensions, of wall thickness at all points, of interior surface smoothness.

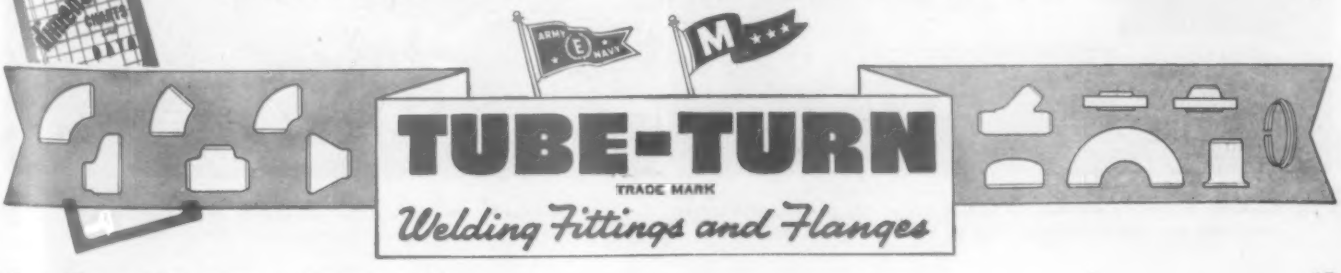
Tube Turns' exclusive manufacturing methods, plus constant vigilance in laboratory and plant inspection of materials and finished products, guarantee welding fittings that are *uniformly* sound, dependable and in accordance with all ASA., ASTM and other applicable standards. Write for Catalog 111.

New Dimensional Folder

Write for this convenient pocket-size folder containing condensed data on all Tube-Turn welding fittings and flanges.

SELECTED TUBE TURNS DISTRIBUTORS IN EVERY PRINCIPAL CITY ARE READY TO SERVE YOU WITH COMPLETE STOCKS.

TUBE TURNS (Inc.) Louisville, Kentucky. Branch Offices: New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Dayton, Washington, D. C., Houston, San Francisco, Seattle, Los Angeles.



On the Job

Helium-Shielded Arc Welding

DEVELOPED originally for magnesium, helium-shielded arc welding has found other important applications in the fabrication of light-gauge metals. By using this process, the Lockheed Aircraft Corp. expects to increase production speed 30% in the fabrication of stainless-steel manifold exhaust collectors and to reduce costs in this one department at the rate of $43,000 per year, according to Jack Porter, Lockheed plant number two department foreman. Twenty-five helium-shielded electrode holders will be used.

Courtesy, General Electric Co.

A Lockheed operator welds a part of a stainless-steel exhaust collector ring by the inert-gas-shielded method.

In this process, the holder is provided with a tube surrounding a carbon electrode. The tube conducts a low-velocity stream of helium gas to the arc. The gas tends to concentrate the heat in the immediate vicinity of the arc and so has a beneficial cooling effect on the deposited weld metal. Because the heat does not have the chance to travel any great distance from the vicinity of the weld, warpage-after-cooling is largely eliminated.

The estimated yearly savings of $43,000 will result from the speed and high quality of the welding and from the elimination of flux and the alcohol and shellac required for mixing it.

Because of the need for uniformly good fit-up in the inert-gas-shielded process, new dies had to be made to accommodate new and improved welding fixtures. The cost of this work was counterbalanced by the elimination of tack welding, required under the former method.

» «

Welded Steam Condenser

A STEAM condenser built out of old boiler tubes by student weldors is shown in the accompanying pictures, reproduced through the courtesy of Oscar Marquardt, Menard, Ill., and George Holman, Marissa, Ill. The condenser is able to distill 80,000 gallons of water every 24 hours. It was built for an institution power plant, to operate at pressures not exceeding 5 psi. As shown in Fig. 1, it has the approval of the state boiler inspector.

More than 500 welds were made, most of them in the positions shown. Most of the larger welds were made at an angle of 45 deg to the horizontal. The same electrodes were used for all positions. The I-beams on which the condenser rests were arc welded to vertical supports (made of boiler tubing) in order to hold each stand of condenser tubes in place.

Fig. 2 shows the designer and builder, Oscar Marquardt, master mechanic of the institution, and Chief Engineer Ed Meinert watching the steam gauge as the welds were being tested under pressure.

» «

Monel Salt Dissolvers

CORROSION-RESISTING rock salt dissolvers to make available an unfailing supply of filtered, saturated salt brine were built by the St. Mary Iron Works, Franklin, La., for the Jefferson Island Salt Co.,

Courtesy, The International Nickel Co., Inc.

These rock salt dissolvers were fabricated by welding 16 gauge Monel sheet with Monel electrodes.

Jefferson Island, La. The size illustrated is able to produce over 500 gallons of brine per hour.

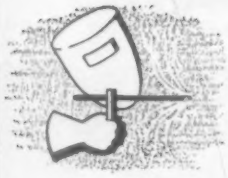
Monel, which has an excellent resistance to salt solutions, was used for all parts of the unit in contact with the brine. The shell, cone, hopper, overflow ring and filter assembly were all made of 16 gauge Monel sheet. All of the seams in shell and cone were lap welded, using 3/32 in. Monel electrodes.

The overflow ring around the top of the tank leads to an overflow drain pipe through which any sludge or dirt floating on the surface of the brine may be discharged. This is accomplished by depressing the float valve manually.

Fig. 1—Built by student weldors out of old tubes, this power plant steam condenser was tested and approved by the state boiler inspector.

Fig. 2—Master Mechanic Oscar Marquardt and Chief Engineer Ed Meinert watch the gauge as the welds are pressure tested.

PAGE *Welding* ELECTRODES



PAGE COATING HELPS YOU ON YOUR STAINLESS WELDING

Certainly it is important to you that PAGE developed a range of electrodes for welding stainless steel that is complete.

But don't overlook the important value to you of the PAGE coating on these electrodes—sufficiently heavy to provide the shield necessary to prevent oxidation; to provide the protection of easily removed slag that permits more cooling time; that eliminates surface checking, and that holds spatter loss to a minimum.

PAGE ALLEGHENY STAINLESS STEEL ELECTRODES provide the metal you want, help you get it where you want it and protect the job your men do. Ask your local PAGE Distributor.

PAGE STEEL AND WIRE DIVISION

Monessen, Pa., Atlanta, Chicago, Denver, Los Angeles, New York, Pittsburgh, Portland, San Francisco

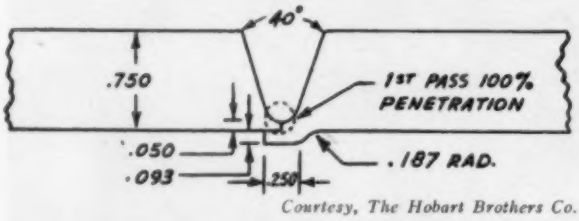
AMERICAN CHAIN & CABLE COMPANY, Inc.

BRIDGEPORT • CONNECTICUT

ESSENTIAL PRODUCTS . . . TRU-LAY Aircraft, Automotive, and Industrial Controls, TRU-LOC Aircraft Terminals, AMERICAN CABLE Wire Rope, TRU-STOP Brakes, AMERICAN Chain, WEED Tire Chains, ACCO Malleable Castings, CAMPBELL Cutting Machines, FORD Hoists, Trolleys, HAZARD Wire Rope, Yacht Rigging, MANLEY Auto Service Equipment, OWEN Springs, PAGE Fence, Shaped Wire, Welding Wire, READING-PRATT & CADY Valves, READING Electric Steel Castings, WRIGHT Hoists, Cranes, Presses . . . *In Business for Your Safety*

Welded Tube Joint

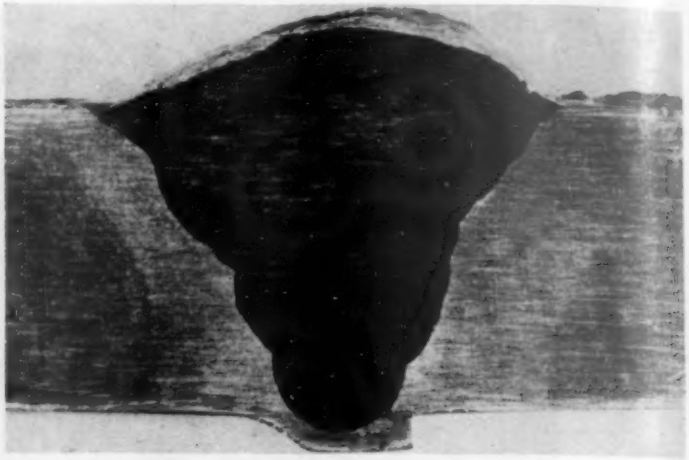
RUSSELL MEREDITH, of the Meredith Welding Co., Los Angeles, claims that many parts heretofore thought impossible to join by welding can be welded without distorting if the joint is properly prepared. As evidence of this assertion, he designed a joint for welding thick-walled aircraft tubing where perfect alignment had to be maintained.



Courtesy, The Hobart Brothers Co.

This joint was designed for heavy-walled aircraft tubing in which perfect alignment had to be maintained.

Right: Longitudinal cut of the tube through the welded joint. Note complete penetration.



This tubing part was to be machined inside and out, both before and after welding. The preparation of the joint is in the form of a male and a female seat. The male seat acts as a backing-up plate and allows 100% weld penetration without leaving icicles on the inside of the tube.

The sketch depicts the wall of the tube as jointed and ready for welding. An enlarged photograph of a longitudinal cut through the weld is also reproduced.

» «

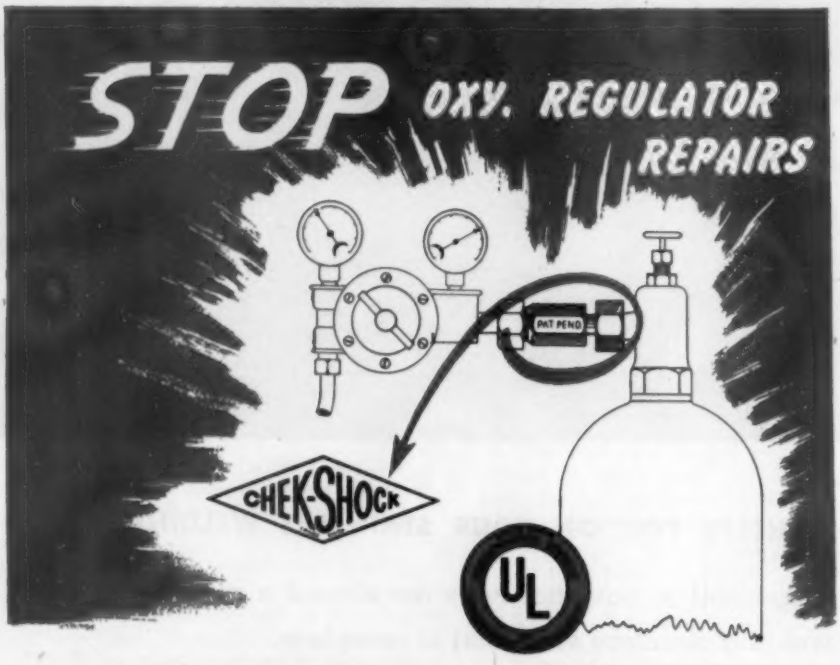
Mexican Scene

THE Pan American Clipper now flies over the city where once stout Cortez wrested the throne of the Aztecs from proud Montezuma. Below, a mechanic is arc welding a landing gear strut at the Cia Mexicana de Aviacion hangar at Mexico City Airport.

Courtesy, The Lincoln Electric Co.

Arc welding helps to keep Pan American Airways ships in perfect flying condition.

THIS IS IT!



— CHEK-SHOCK Oxygen CUSHION Valve —

- Will allow tank valve to be opened rapidly without damage to regulator or danger to operator.
- Will prevent unnecessary internal wear in regulator *(as, NOT necessary to release control screw before opening tank valve).*
- Will eliminate possible injury to operator from burstings.
- Will increase life of regulator assembly.

This NEW automatic safety device CUSHIONS the initial BLAST of pressure when tank valve is turned on *(this uncontrolled surge which strikes like a hammer, is the direct cause of most damaged regulators and accidents.)* Thereafter pressure slowly equalizes and then CHEK-SHOCK allows a full flow of oxygen.

ONLY ONE MOVING PART, POSITIVELY FOOLPROOF

PRICE IS LESS THAN ONE REPAIR BILL

Coupler type (will fit any std. size welding type oxygen regulator) ..... $6.00 ea.
Screw-in type (for removable inlet stems, ¼" std. pipe) ..... 5.00 ea.
Also made for all types of couplings to fit *MEDICAL* regulators ..... 7.00 ea.

See your distributor or write—

Safety Shock Manufacturing Co.
FOWLER, CALIFORNIA

Welder's Best Friend

ACTUAL SIZE
MODEL 3RS
300 amp.

ELLS' new STUBBY model electrode holder rms a real bond between the welder and the job. 300 amp. capacity holder, STUBBY makes welding easier, quicker job because it is:
IGHTER • SHORTER • SMALLER DIAMETER

TUBBY'S special advantages are:

MORE WELD FOOTAGE—Due to aller size, lighter weight, holder is sier to handle in tight spots, for overhead bs, and inaccessible corners. Operator periences less fatigue.

LOWER ROD COST—UP TO 14% Special copper-alloy vise body, encased plastic re-inforced cap grips rod at the ry tip, does not harm coating, permits urning rods right down to 1 inch.

WORKS COOLER—STUBBY is 00 percent insulated—stream-ined handle encloses all metal arts. Re-inforced snap-on insulator tubular in form, has no irregular urfaces.

et STUBBY do that tough job for *you*. ee or write our distributors.

EXCLUSIVE MANUFACTURER

Martin Wells

5886 Compton Avenue, Los Angeles 1, California

These Wells' "Servgrip" distributors have warehouse stocks, can supply you immediately.

Bay City — Northern Supply Co.
Birmingham — Elbert & Kirkman Co., Inc.
Cedar Rapids — E. D. Lamb Sales Co.
Chicago — Steel Sales Corp.
Cincinnati — Williams & Co., Inc.
Cleveland — Williams & Co., Inc.
Columbus — Williams & Co., Inc.
Milwaukee — Steel Sales Corp.
Detroit — Steel Sales Corp.
Wolff Acetylene Co.
Honolulu — Hawaiian Gas Products, Ltd.
Houston and throughout Texas — Magnolia Airco Gas Products Co.
Minneapolis — Steel Sales Corp.
Omaha — The Selbach Company
Fuchs Machinery & Supply Co.
New York — Chicago Combustion Co.
Phoenix — Arizona Welding Equipment
Pittsburgh — Williams & Co., Inc.
Saginaw — Northern Supply Co.
St. Louis — Steel Sales Corp.
San Francisco — Pitts & Loughlin
Spokane — Gibson Welding Supply Co.
Vancouver, B. C. — Scott-Foster & Co.

Air Reduction Sales Company. Offices in principal cities throughout the United States.

When You Can't Get Repair Parts—*Try Welding*

Reclamation and hard-facing of clay products equipment parts is far from a novelty; but, during this period of stringent metals scarcity, Amsco conservation welding has played an indispensable part in maintaining production.

Almost any ferrous wearing part for heavy duty machines is susceptible to the rebuilding process with Amsco nickel-manganese steel rod, supplemented by the use of filler bars and shapes where massive reproduction is necessary; and most units subjected to frictional or abrasive wear should be hard-faced with Economy Hardface or Amsco No. 459, either when new or after the restoration to size. Brick machine augers and dies, muller pan parts, pug-mill knives and power-shovel dipper teeth are only a few of the numerous opportunities.

The user of the pug-knives shown in 665 told us that an Economy Hardfacing gave him twice as long wear at less cost as was obtained from another welding rod.

The rebuilding of dipper teeth, illustrated in A213, is quickly and economically done with manganese steel repointers, attached and filled in with nickel manganese steel weld metal.

A review of Bulletin 941-W will disclose other instances of this sort. Send for your copy.

665

Amsco

AMERICAN MANGANESE STEEL DIVISION

Chicago Heights, Illinois

FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

AMERICAN Brake Shoe COMPANY

Traveling Platform

SWINGING through the air with the greatest of ease, an all-welded traveling platform (cage) permits spray painters to reach any point vertically, longitudinally or laterally in the space to be covered. The platform was developed by the Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O. It can be raised or lowered without swing as firmly as though held by vertical guides and can be traveled to any point longitudinally or laterally in the area covered by the crane which carries it.

It looks something like a mine cage, but it can be moved in three dimensions to reach any designated point in the space covered.

Of all-welded steel construction, the platform was designed primarily for the spray painting of large air cargo ships and to aid with some of the assembly operations. The floor area is divided into a rear section for drums of paint and other equipment and a large front space for the painter's use.

Three master drum controllers, mounted on the railing at the rear of the painter's area, provide for variable-speed operation of the hoist, bridge and trolley motions. In addition, three sets of foot-operated controllers on the floor provide for single-speed motion. These foot controls enable the painter to move himself along at the slow speed convenient for spray painting while both of his hands are free to hold the spray nozzle.

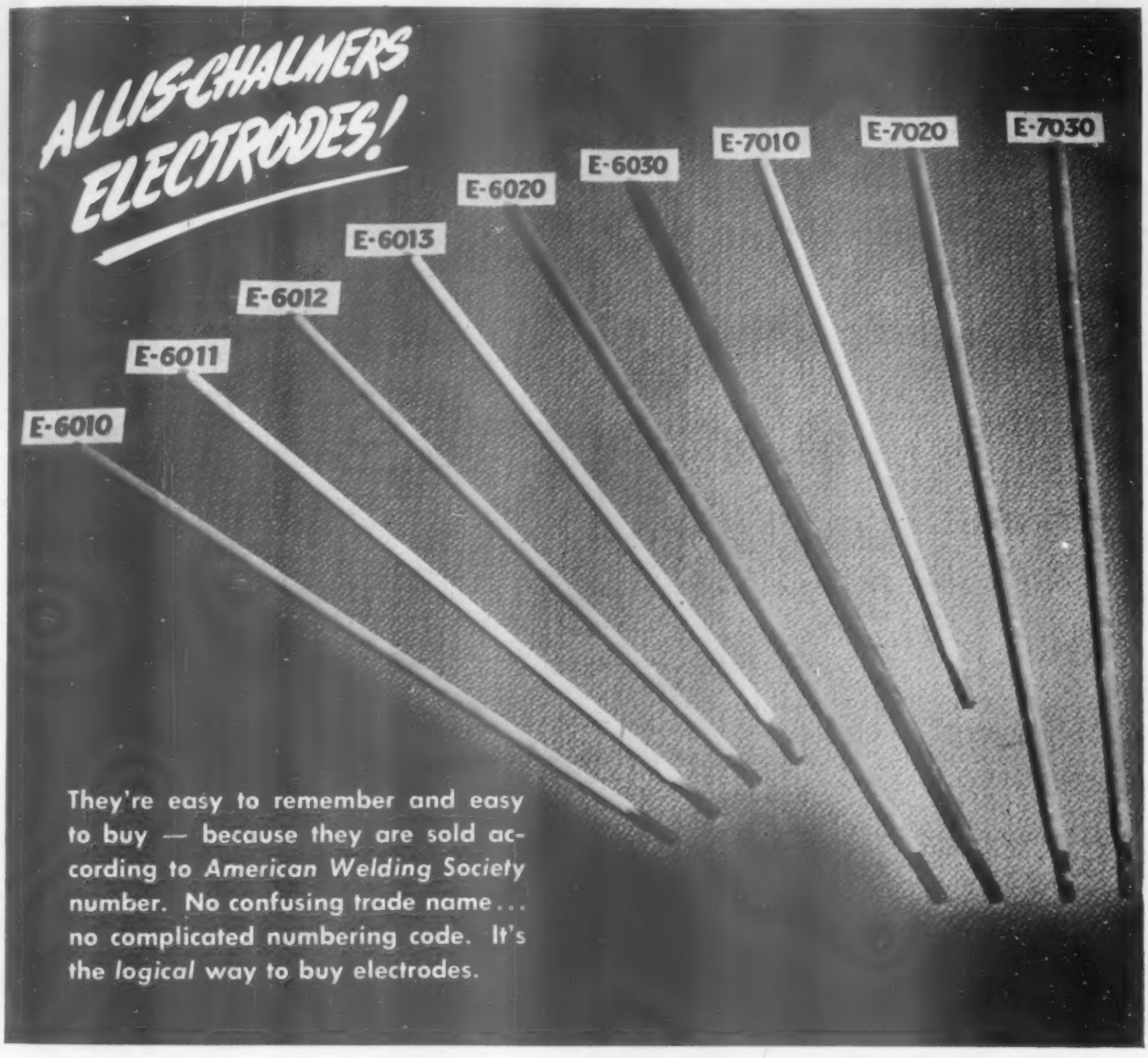
The unit illustrated will carry a load of 5 tons and is suitable for operation through a vertical height of up to 30 ft. It may be furnished for operation at any hoisting speed from creeping up to 50 fpm or more.

Any Interesting Jobs?

HOW ABOUT sending us some of your own work for "On the Job?" Just a few words and a photograph will do the trick. Payment will be made at our usual rates. Address: Editorial Department, THE WELDING ENGINEER, 506 S. Wabash Ave., Chicago 5.

Air Reduction Sales Company. Offices in principal cities throughout the United States.

PRODUCT OF THE MONTH


ALLIS-CHALMERS ELECTRODES!
E-6010
E-6011
E-6012
E-6013
E-6020
E-6030
E-7010
E-7020
E-7030
They're easy to remember and easy to buy — because they are sold according to *American Welding Society* number. No confusing trade name... no complicated numbering code. It's the *logical* way to buy electrodes.

MILWAUKEE, WIS. — Allis-Chalmers announces new line of smooth-flowing arc welding electrodes having quiet arc characteristics . . . in both a-c and d-c types. Use of standard AWS number and color simplifies handling, makes selection easy. Write today for bulletin B6340.

A 1767

WE WORK FOR VICTORY · WE PLAN FOR PEACE

ALLIS-CHALMERS · MILWAUKEE · WISCONSIN

Induction Silver Brazing

WEBER Showcase Co., Los Angeles, recently secured a contract to build metal life rafts which can be launched from a foundering cargo vessel or oil tanker. These rafts are tested by dropping each of them three times—on end, side and flat—from a height of 45 ft to the water. Joints that can stand up under this drastic treatment have to be good.

A raft sounds like a simple thing, but these products are unbelievably complex. One raft alone has 48 manganese-bronze drain flanges to be joined to sections of 1020 steel. The flanges were first brazed into place, but this was found to be a "slow" method since it took 7 to 12 min per flange.

Once a production bottleneck, the joining of manganese - bronze flanges to the steel deck of this life raft is now the fastest part of the assembly.

Courtesy, Handy & Harman

The combination of a low-temperature silver-brazing alloy and induction heating eliminated this production bottleneck by reducing the joining time to 51 seconds per flange. The parts are first properly cleaned and fluxed; then a silver alloy washer 0.003 in. thick is preplaced between the flange and a raft section. Using induction heating, an operator and one helper complete strong, leak-tight joints which hold firmly in place through every drop test the raft is compelled to meet.

» «

Small Shop, Large Item

EVIDENCE that the size of a welding shop does not necessarily restrict the size of its jobs is provided from Minneapolis, where Ahlberg's Machine & Welding Co. utilizes the yard outside to fabricate such products as the big trailer pictured below.

Courtesy, The Lincoln Electric Co.

Welded trailer of large capacity for hauling heavy construction equipment.

This trailer, which measures 8 by 16 ft at its base, is used to haul such equipment as power shovels and bulldozers to the site of a construction job. The unit has a capacity of approximately 25 tons.

The various sections were cut to specifications from ⅜ in. plate and joined by butt and fillet welds made with AWS E-6010 mild steel electrodes. The vertical members measure 42 in. overall with 5 ft connecting pieces into which a tool box was incorporated. The bed frame is of 12 in. H-beams with a 5 in. web. The floor structure consists of 5/16 in. diamond plate; this was joined by skip welding, using the step-back technique.

About 75 small tractor units have been welded at the Ahlberg shop.

Knock-Out

A. C. WELDERS

The World Over

Engineered correctly by men with years of experience. Silent operation, ease in striking arc, wide range of application, low initial cost, economy of operation, negligible upkeep, burn-out proof transformers, all go to distinguish K-O *Welders*. These time-tested units are made to serve their employer well and show him a substantial profit whether on maintenance or production.

20 to 550 amps.

See your nearest K-O jobber or write for bulletin No. 41-84.

K.O. LEE CO.

ABERDEEN SO. DAK.

Interested in Stainless Welding?

this Free Book answers many questions about Welding Stainless Steels

The more you know about the characteristics and reactions of stainless steel, in its many analyses, the better able you will be to cope with the problems of welding it.

The McKAY line of Stainless Steel Welding Electrodes is as *complete* as it is *excellent.* You can utilize each grade of McKay Electrode most effectively . . . and avoid pitfalls before you meet them . . . by keeping abreast of stainless developments. Stainless Steel has been called the "metal of the future." Know-how, gained now, will pay big dividends later.

Write for the FREE booklet "Things to Know About Welding Stainless Steels." It fully explains the answers to the quiz questions below and includes, as well, other valuable welding information.

Can You Answer these Toughies? The Free Book Explains 'Em Send for it Today!

		True	False
4.	The ability of Stainless Steels to resist corrosion is proportional to the amount of chromium contained in the steel.	☐	☐
5.	Titanium Metal is an excellent carbide stabilizer but if placed in Electrode Coatings or Core Rods it will not prevent Carbide precipitations in the weld metal.	☐	☐
6.	Grain growth in straight chrome steels is caused by carbide precipitation.	☐	☐

Answers: (4) True (5) True (6) False

Questions 1, 2, 3 appeared in last month's ad. Other questions will appear next month. Watch for them!

General Sales Office: York, Pa.

THE McKAY COMPANY
PITTSBURGH, PA.

WELDING ELECTRODES . . . COMMERCIAL CHAINS . . . TIRE CHAINS

Short Cuts and Kinks • • •

The Exchange of Ideas Leads to Progress

Help Wanted, *please!*

THIS is the one place where you may "get more than you put in," for all the ideas given here are yours without contributing anything in return. Don't be that kind of fellow, though! If you have a welding idea to pass on, then get the kick of seeing your name in print, help others to win the war and help us to keep this feature alive. Send anything you think suitable to Short Cuts and Kinks, THE WELDING ENGINEER, 506 South Wabash Ave., Chicago 5.—*The Editors.*

Sixteen Instead of One

By Fred Schneider

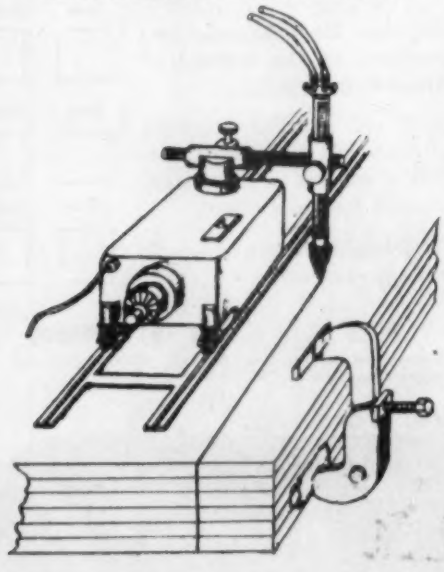
IT WAS formerly the practice in the production of comparatively small plates (such as those used in the deckhouse bulkheads of Liberty ships) to lay out and flame-cut each plate individually and then transport each finished plate to its storage rack. I suggested to the Labor-Management Committee of Richmond Shipyard No. 1, Richmond, Calif., that stack cutting of small plates would greatly increase output and greatly reduce handling time.

We now cut simultaneously as many as 16 plates of 3/8 in. thickness (as many plates of heavier thickness can be handled as will stack to an overall thickness of about six inches). The upper plate of the stack is laid out to the desired form, and heavy C-clamps are employed to squeeze the stack of plates together. It is necessary to eliminate all air spaces between the plates, or it will not be possible to produce a cleanly cut edge on the stack.

For cutting, we use a conventional-type flame-cutting machine which runs on a standard track laid on the uppermost plate. This machine is equipped with a single torch fitted with a high speed tip. Oxygen pressure ranges from 60 to 100 psi.

Stack cutting has increased our output of small plates 15 times as the plates are now carried in stacks of 16 from the storage yard to the flame-cutting table and back to the finished storage with no more time than these operations formerly took for one plate. In addition to the increased output and reduced handling time, substantial savings in oxygen have been effected.

Stack cutting procedure. Heavy C-clamps are set at appropriate intervals in order to squeeze out all air spaces between the plates. The number of plates in the 6 in. (average) stack will depend on the plate thickness.



» «

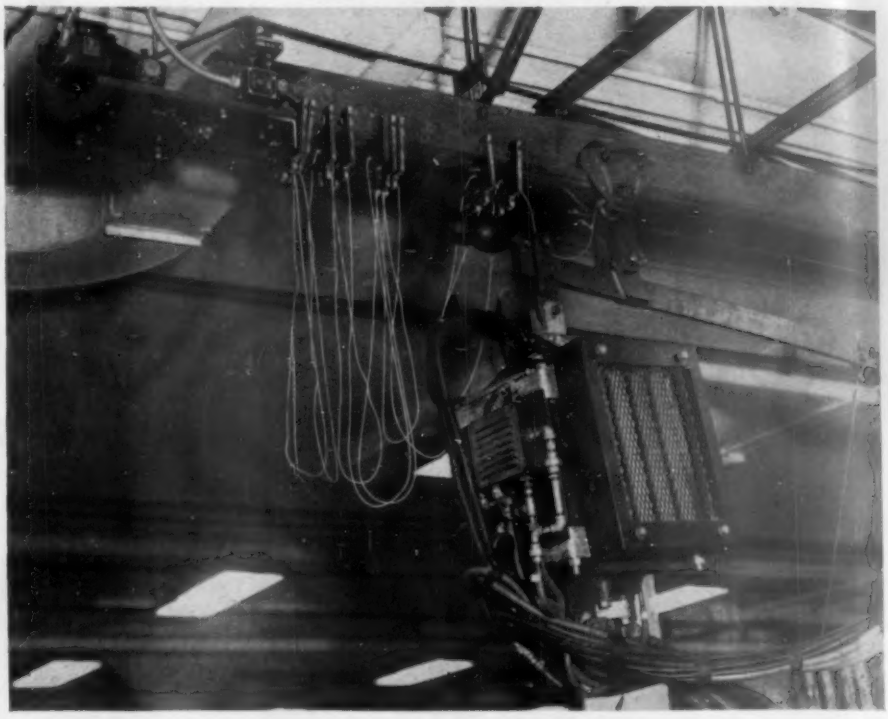
Flying Bridge Bulwark Rail

By Theodore H. Conte

ONE OF the most difficult welding jobs at Richmond Shipyard No. 1 was to add a 1 in. diameter galvanized pipe to the top of the bulwark. Under the old method, the pipe could not be held firmly on top of the rail nor made to conform correctly because of the weaving plate edge The weld operation was continuous.

I suggested to our Labor-Management Committee that the pipe be milled, cutting a straight and smooth groove. The grooved pipe is then inverted over the flying bridge bulwark rail. It fits down over the edge of the rail and can be tacked to either a low or high position. The pipe is stagger welded.

The idea has saved us 15 man-hours per month in the installation of these pipes.



Traveling spot-welding apparatus for tacking bomb bay door assemblies. Note the overhead trolley.

Tacking Spot Welder

THE production of B-26 bomb bay doors at The Glenn L. Martin Co., Baltimore, already greatly speeded through the use of spot welding in place of riveting (see page 52, June, THE WELDING ENGINEER), has been further accelerated by the introduction of a portable spot welder to tack weld parts together in the final assembly fixture.

Previously, it was first necessary to assemble the parts in a drill fixture where holes were drilled for skin clamps. The parts were then disassembled in order to clean and burr them for spot welding. They were then put together, fastened with the skin clamps and spot welded; after spot welding, the clamps had to be removed and the holes filled by driving in rivets.

All of the above is done away with under the new procedure. The skin, frames and stiffeners for the doors are cleaned for spot welding and assembled in a fixture. They are then tack welded by spot welding, and the entire assembly is carried to a floor-type spot welder for finish welding.

The portable spot welder used for tacking is a 200 kva machine having a welding capacity of two thicknesses of 0.040 in. aluminum. The machine and transformer are counterbalanced on a small beam pivoting from an overhead trolley traveling along a 50 ft I-beam. The trolley is driven by a sprocket and chain, powered by a 1/3 hp electric motor.

The traveling spot welder operates over a large floor area. Spacers are provided on the I-beam to support the drive chain when the apparatus moves from the end of the beam.

Welded Drawer Handles

HANDLES that can't be pulled off are easily formed from scrap conduit pipe, as shown in the accompanying picture. Here

Courtesy, The Lincoln Electric Co.

These welded drawer handles were formed by bending and flattening the ends of two short lengths of scrap ¾ in. conduit pipe.

two lengths of ¾ in. pipe were bent into a "Z" at either end. After flattening, the ends were welded to the face of the metal drawers.

This type of handle may be used on the drawers of factory or shop work benches, stockroom bins, etc. It requires no bolts, nuts or drilling and will positively never jar loose.

» «

Lightweight Manifolds

By Ken Kerslake and Don Pullman

TO AVOID the use of cranes and the consequent delays which occur in the moving of heavy oxygen and acetylene manifolds to various locations about a ship under construction, we submitted a design for a lightweight auxiliary manifold that could be picked up and placed anywhere on the ship by one man. This suggestion was accepted by the Labor-Management Committee, Consolidated Steel Corp., Wilmington, Calif., and the proposed manifolds were made from ½ in. pipe, with 1 in. flat bars used as guards.

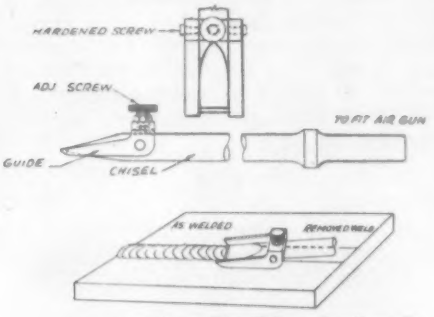
This new type of manifold may be set on the deck of a ship or hooked over the bulwark rail, and they are light enough to be carried about by one man with ease. In addition to avoiding crane time, the new manifold can be placed closer to the work, eliminating excess hose. The use of these manifolds results in a saving of 153 man-hours per hull plus some 20 lifts by a crane, which was ordinarily required in moving the heavier type of manifold.

These new lightweight oxygen and acetylene manifolds may be set on the deck or hooked over the bulwark rail as shown.

» «

Weld-Removing Chisel Guide

THIS weld-removing chisel guide was designed by Russell Meredith, Los Angeles, to use where flush, smooth surfaces are required. It has saved many hours of finishing time in a Pacific Coast aircraft



Courtesy, The Hobart Brothers Co.

With this guide, welds may be finished with an air-operated chisel instead of by grinding.

plant, where it reduced the cost of weld finishing from .50c per foot (the cost of grinding) to .15c per foot.

The guide is attached to the end of the air gun, as shown in the accompanying illustration. It was originally designed for soft materials such as aluminum, bronze, Everdur, magnesium, etc., but it may also be used on mild steel.

» «

Pipe Fitting Simplified

By Elton Sterrett

A COMMON sight in many refinery and pump station yards is that of two or more men wrestling with wrenches and a refractory section of pipe which they are attempting to break into component fittings or else make service tight. As the men

Fabricated from pipe nipples and a bit of old rail, this "helper" does the work of an extra man in breakdown or assembly of pipe fittings.

work, the threads, valves and fittings are exposed to possible clogging (and to certain injury) in the dirt and grit.

With the stationary "helper" illustrated, one man can do the assembly or breakdown for which two were formerly needed, and the parts are kept free of dirt. The foundation of the device is an upright of 10 in. pipe embedded in concrete and projecting some 30 in. above its bed. To this, there were welded four threaded pipe nipples having diameters of 2, 2½, 3 and 4 in. The axes of these nipples meet at right angles. Atop the upright, there was welded a short section of railroad rail to serve as an anvil for jarring rusted or corroded fittings.

To make up a section composed of fittings and nipples, the end fitting is run up on the proper size nipple, and a back-up wrench is placed, with its handle resting on a block of wood. The assembly is then completed, moving the back-up wrench as required. A reducer or bushing is used for sizes other than those provided by the four welded nipples.

» «

Air Blanket

Courtesy, The Linde Air Products Co.

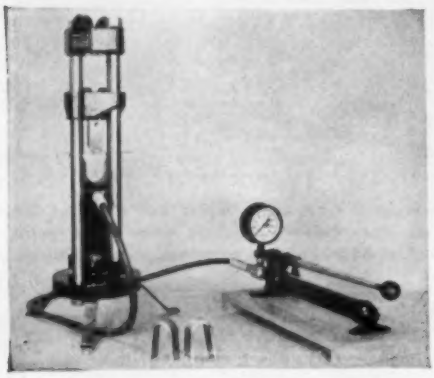
It gives the welder a compressed air shield.

To protect the gas weldor from the heat of a large operation, the ingenious set-up illustrated above is said to be of great help. The "air blanket" directs a stream of compressed air between the weldor and his work in order to shield him against the intense heat. It is made from a 3 ft length of 2 in. diameter pipe. One end of the pipe is welded closed, and the other end fastened to the air supply by means of a nipple and hose. A row of holes is drilled along the length of the pipe, and two studs are welded to the underside to hold the device upright.

New Products to Use

Weld Testing Machine

★ An improved portable weld testing machine just introduced by Airco will perform all of the three chief weld tests; namely, (1) reduced section transverse tension test, (2) guided bend test (a complete 180 deg face or root bend) and (3) longitudinal all-weld metal tension test (0.505 in.).



Airco weld tester. This illustration shows positions of die and plunger at the beginning of a guided bend test.

Relatively light in weight and hand operated, this tester is said to be particularly useful for field work such as pipe line installations and other construction welding performed in remote locations. In performing tension tests, the operator with a few strokes of the lever can apply a direct load up to 40,000 lb.

The machine operates on the principle of the hydraulic jack. A small pump builds up relatively high pressures (approximately 8,000 psi) which are transmitted through the high-pressure hose to a ram. The ram has an area of about 5 sq. in., and it exerts an effective load that is five times the working pressure at the pump. The pressure gauge is calibrated to read the load applied by the ram, taking into consideration frictional losses as well as the actual pressure applied. While the maximum direct load is 40,000 lb, the use of reduced-section specimens will permit tensile strength tests of 150,000 psi or even higher.

Standard equipment includes jaws for making the transverse tension test and the plunger and die needed for the guided bend test. Jaws for the longitudinal all-weld-metal tension test, however, must be ordered separately. **Air Reduction Sales Co.**, 60 East 42nd St., New York City 17.

» «

A-C Electrode

★ A new general-purpose electrode for mild steel, designated as "Fleetweld 35," is offered specifically for a-c welding by **The Lincoln Electric Co.**, Cleveland. However, it will also operate on d-c, with either straight or reverse polarity depending upon the type of work being done. It conforms to AWS specifications E-6010 and E-6011.

This new shielded-arc electrode is said to have all the desirable characteristics of other "Fleetweld" electrodes. It is available in 1/8, 5/32 and 3/16 in. sizes, standard 14 in. lengths. As-welded weld metal specimens show test tensile strength of 62,000 to 70,000 psi, yield strength of 52,000 to 57,000 psi and elongation in 2 in. of 23 to 30%.

» «

"Ball-Grip" electrode holder. Less than a quarter turn will grip a new electrode for work or allow the stub to fall out.

Electrode Holder

★ In the new McClary "Ball-Grip" holder, the curved surface of a ball is employed to exert pressure against the electrode, which rests flat against the tapered end of a metal-cap insert. The current is carried by the cap insert and not by the ball. The electrode is held at a slight forward angle for ease in handling, the ball providing a positive grip that does not bend or "chew up" the rod. Less than a quarter turn will grip the electrode for work or allow the stub to fall free for insertion of a new electrode. The holder, states manufacturer, is light in weight, well balanced and compact. **McClary & Byers Equipment Co.**, 731-55th St., Oakland, Calif.

» «

Electrode Holder Insulators

★ **Jackson Products**, 3265 Wight St., Detroit 7, announces a new type of insulator to be used on its insulated tong-type electrode holders. These new insulators are interchangeable with all Jackson insulated tong-type holders now in service. Four definite advantages for the new product are claimed by its manufacturer: (1) the metal-clad jaw covers (insulators) increase holder life and cut maintenance costs; (2) an arched construction gives greater strength; (3) the rounded surface tends to deflect heat and weld splatter; (4) the vents are properly placed to provide for a free flow of air which eliminates trapped heat.

New Jackson insulators give electrode holders longer life and cooler operation. They can be applied to any tong-type holder of this manufacture.

Outdoor A-C Welders

★ Two new outdoor transformer-type a-c welders, a 500 amp and a 300 amp model, have been announced by the **Electric Welding Division of the General Electric Co.**, Schenectady. The 500 amp welder has a current range from 100 to 625 amp, while the range of the 300 amp welder is from 60 to 375 amp. Both are specifically designed for use in shipyards and similar outdoor locations where exposure to the weather is common.

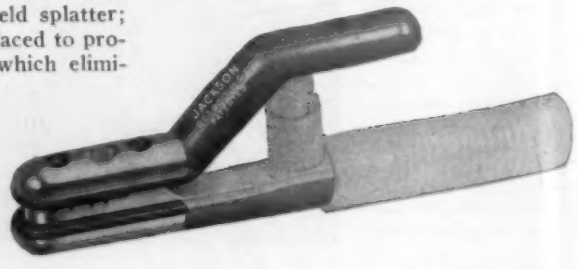
G-E outdoor arc welder, Type WK-15, Model 6 WK1503, rated 300 amp, 220/440 to 75 volts, 60 cycles a-c.

In addition to incorporating the features of G-E indoor a-c welders, the new welders are equipped with an "idlematic" control which functions automatically to reduce the output voltage to less than 30 volts whenever the arc is not in operation. Protection against the entrance of rain, snow, sleet, etc. is provided by the drip-proof construction of all ventilating openings and by a sealed window over the current indicator. A special finish on internal parts protects them against corrosion.

» «

Rawson Disintegrator

★ This new invention is said to disintegrate almost any metal into a small multifractured chip that can be converted to a fine powder with one hammermill operation. Cast iron and some other metals can be reduced to a fine powder directly without the necessity of hammermill operations. The machine is equipped with a feed mechanism that regulates the feed and can be adjusted to various speeds and size of powder, grit or shred. **Franklin McAllister Corp.**, 135 S. LaSalle St., Chicago 3.



ONE SOURCE FOR MANY WELDING MATERIALS

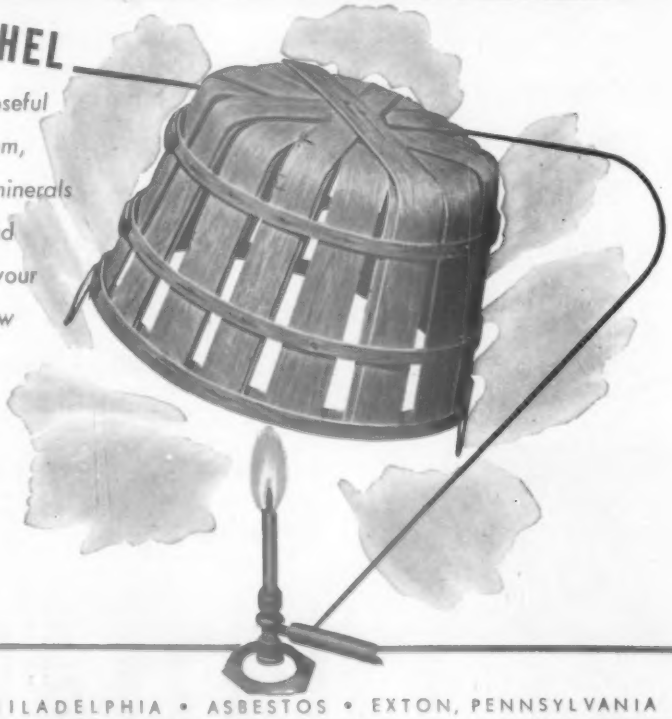
EVEN though you may be a customer of ours, the growth and widening scope of Foote welding materials may come as something of a surprise to you. Latest of the additions is Weldalene, a "silica hungry" rod compound, a more active flux over a longer range than feldspar. Weldalene has a low fusion temperature which makes it easy to adjust slag viscosities downward when necessary. Notable among other widely used Foote welding materials are Standard Rutile, Calgran and Pariflux. Standard Rutile is free from annoying Zircon, produces less spatter and a high burning rate. Calgran (Foote Calcium Carbonate) is especially recommended for low reactivity with sodium silicate, Pariflux (Foote Calcium Fluoride) for its low sulphur and phosphorus content. Both Calgran and Pariflux are particle-size controlled by our laboratory. Foote Hymag (asbestos) helps rod makers attain both low spatter and a smooth finish. Manganox (Foote Manganese Dioxide), often substituted for Ferro Manganese, is specially treated to reduce available oxygen. Foote Ferro Silicon is prized as an active deoxidizer for stainless rods. It, too, is especially treated, to eliminate gassing and undesirable carbides. Foote Magbond, originally developed as a colloidal gelatinous binder and lubricant for fluxes, has been found of definite value in reducing ferro manganese gassing.

Aluminum welding owes its practicability to lithium salts, chiefly lithium chloride and lithium fluoride, both of which Foote processes.

In addition to these few products highlighted, Foote also produces Titanalba, Ilmenite (Lithium Ore), Tanarc (Titanium Zirconium Ferrate), Ferro Titanium, Manganese Dioxides and Carbonates, Ferro Manganese, Iron Oxides, Ferro compounds, Chromate, Silicates and other fluxes.

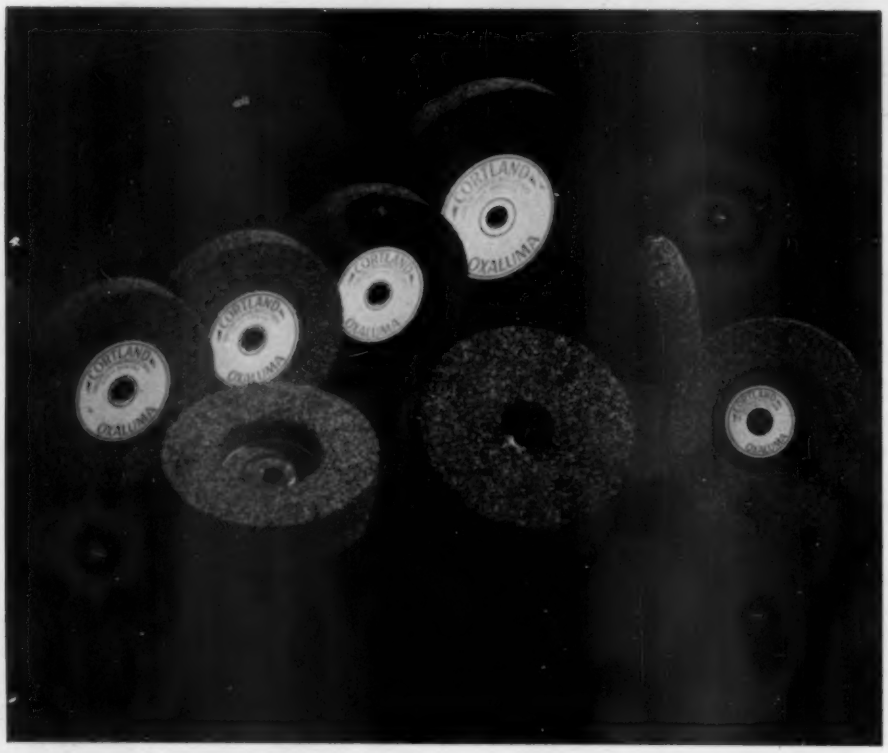
THE LIGHT UNDER OUR BUSHEL

If there be a light under our "bushel" it is the purposeful glow of a Bunsen burner, throwing new light on lithium, strontium, zirconium and a host of other ores and minerals packed with industrial possibilities. Through research and processing Foote brings new ideas and products to your eyes; works with you in their development. Now is the time to let us help you take advantage of Foote research and manufacture.



Foote
MINERAL COMPANY
A Step Ahead in Industrial Ores and Chemicals

PHILADELPHIA • ASBESTOS • EXTON, PENNSYLVANIA
Home Office: 1612 SUMMER STREET, PHILADELPHIA, PA.
West Coast Repr.: Griffin Chemical Co., San Francisco, Calif. • English Repr.: Ernst B. Westman, Ltd., London, Eng.



"OLD TIMERS" or "GREEN HANDS" get good results with Cortland Wheels

An experienced weld grinder can tear through the excess metal fast, and produce a surface satin-smooth for polishing, or just rough enough for painting.

Whether your men are "old timers" or "green hands," a Cortland Wheel may improve their output. Because Cortland specializes in wheels for weld grinding and snagging—portable, floor stand and swing frame: Vitrified bonded for operating speeds up to 6,500 S.F.M., and Resinoid bonded for operating speeds up to 9,500 S.F.M.

"Tell us about your operations." We'll recommend the best wheels for cutting costs. Write CORTLAND GRINDING WHEELS CORP., 15 Cortland Street, Chester, Massachusetts.

For better Weld Grinding

CORTLAND

Half-Cycle Timer

★ A new Westinghouse spot-welding timer with heat control for timing intervals of one-half cycle or less is announced for welding small objects of high conductivity material such as aluminum or copper. Because the welding current is made to start at the same point on the voltage wave for every operation, the new SP-18 timer is suitable for the welding of such items as radio tube parts and sockets, pig-tail resistors to terminal lugs, watch and instrument parts, contact tips on electrical relays, etc.

Type SP-18 spot-weld timer, rated at 230/460 volts, 50/60 cycles, a-c. It may be set for intervals of one-half cycle or less.

The timer is furnished as a separate control for use with existing small bench welders and also in combination with a small welding transformer. Only one control tube is used, a thyratron serving the dual purpose of rectifying alternating current to charge a firing capacitor and also firing the small ignitron power tube. Heat control is accomplished by a phase-shift method, the adjustment dial for which is mounted on the cabinet door. Further information may be secured from Department 7-N-20, **Westinghouse Electric and Mfg. Co.**, East Pittsburgh.

» «

Steel Stools

★ Lyon steel stools, curtailed early in the war effort, are again available to industrial users who hold priorities of AA-5 or better. Such stools can be purchased for production workers at any place in the plant but not for the cafeteria or the drafting room, the Government order states.

The line includes stools 18, 20, 22, 24, 26, 28 and 30 in. high, with and without adjustable backs and with and without pressed wood seats. **Lyon Metal Products, Inc.**, Aurora, Ill.

Lyon steel stool 26 in. high with adjustable steel back and pressed wood seat—one of the 56 models available for industrial production.

TOOL OF THE MONTH

SYMBOL HAMMER

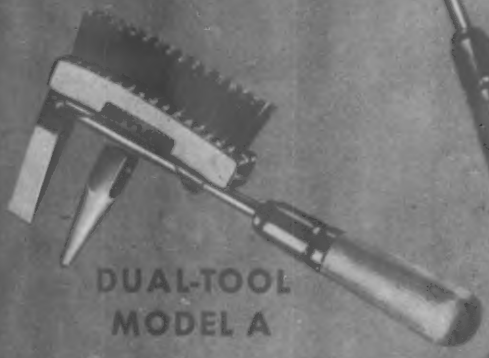
Permanent Welder Identification in the work itself, combined with choice of replaceable chisel or cone, Heavy Duty Slag Removing Bit in a Sixteen Ounce Hammer.

Write for circular describing simplified systems of identification.

The Most Complete Line of Weld Cleaning Tools on the Market

UNIVERSAL TOMAHAWK
"Standard" and "Heavy-Duty" weights

SYMBOL HAMMER
for welder identification



DUAL-TOOL MODEL A

DUAL-TOOL MODEL B

TOMAHAWK MODEL NO. 1
"Standard" and "Heavy-Duty" weights

TOMAHAWK MODEL NO. 4
"Standard" and "Heavy-Duty" weights

TOMAHAWK MODEL NO. 2
"Standard" and "Heavy-Duty" weights

CLEANING BRUSH
featuring "Grip-Tight" Brush Holder

TOMAHAWK MODEL NO. 3
"Standard" and "Heavy-Duty" weights

Engineered Tools of Perfect Balance, Correct Weight; ENDURO Hardened

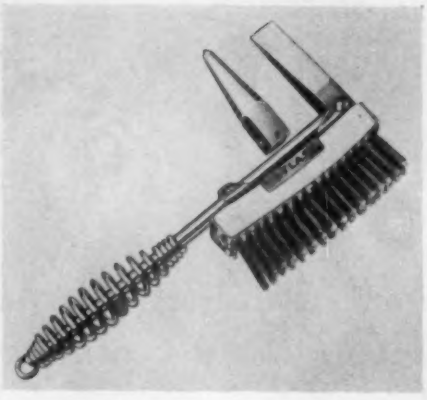
YOUR DEALER will be glad to recommend the ATLAS Weld Cleaning Tool best adapted to your requirements.

ATLAS WELDING ACCESSORIES COMPANY

14820 Wyoming Avenue — Detroit 21, Michigan

Weld-Cleaning Tool

★ Combining wire bristle brush and slag removing head in one unit, the Atlas Model A "Dual-Tool" is an improved weld-cleaning tool for weldors in shipyards, aircraft, tank plants, boiler and sheet metal shops, etc. It features an improved brush holder, which permits removal of the brush for reversing or replacement by inserting a screwdriver at the rear end of the holder. An up-and-outward pry releases tension, and the brush pops out. Reversal of this action when inserting the brush causes it to snap into a firm, rigid seat. "Flex-O" spring-steel handgrip is permanently welded to the handle, eliminating the possibility of loosening or breaking. The chipping head is hand-forged tool steel. **Atlas Welding Accessories Co.**, 14824 Wyoming Ave., Detroit 21.



Every part of this tool is replaceable.

» «

Women's Chipping Goggles

★ A small-size eyecup safety goggle for women chippers is announced by **American Optical Co.**, Southbridge, Mass. Designed for women workers whose eyes are exposed to the hazards of flying particles coming from any direction, this new lightweight goggle is fitted with clear, flat "Super Armorplate" lenses. Each eyecup is designed individually to fit the orbit of the eye. There are broad bearing surfaces for comfort, and the goggle is set low for wide angle vision. Its insulated ball-chain bridge can be quickly adjusted.

Equipped with clear "Super Armorplate" lenses, this new lightweight AO goggle is specially made for women chippers.

» «

Improved Welding Rod

★ Zinc-base die castings, normally difficult to repair, can be reclaimed with "EutecRod 195," an improved gas welding rod now being marketed by the **Eutectic Welding Alloys Co.**, 40 Worth St., New York City 13. The new rod has a lower melting point and still lower bonding temperature than its predecessor, the original rod 195, and is thus easier to apply without danger of damage to the parent metal.

This zinc-base fuel pump die casting was successfully salvaged by using the improved "EutecRod 195" gas welding rod.

M. P. Bailey, of the Northwestern Garage, Indianapolis, does an arc-welding job. His portable welder is powered by a Chrysler automotive engine equipped with a Pierce Universal Governor. The governor, he says, has already given 4 years accurate, trouble-free service.

✓ To Be Sure of the Weld— Be Sure of the Governor!

● In electric arc-welding with current supplied by an internal combustion engine powered generator, constant speed of the power unit is essential.

Holding engine speed constant against variations in load on the generator—and on the engine—requires sensitive, accurate governing. Pierce Governors give that kind of control. Compensation is instant, dependable, unfailing—providing for recovery of current characteristics within *three-tenths of a second* after the arc is struck.

The Pierce *flyball* principle plus rugged design and durable construction assure maximum efficiency and dependability through long, trouble-free service life. Write for full information and the new Pierce Catalog if your units are not Pierce-equipped. To be sure of the weld, be sure the *governor* is Pierce.

THE PIERCE GOVERNOR COMPANY, Inc.
1607 OHIO AVENUE • ANDERSON, INDIANA
Manufacturers of Pierce Precision Governors and Sisson Automatic Chokes
Canadian Manufacturer and Distributor:
BURLEC LIMITED, Toronto 13, Canada

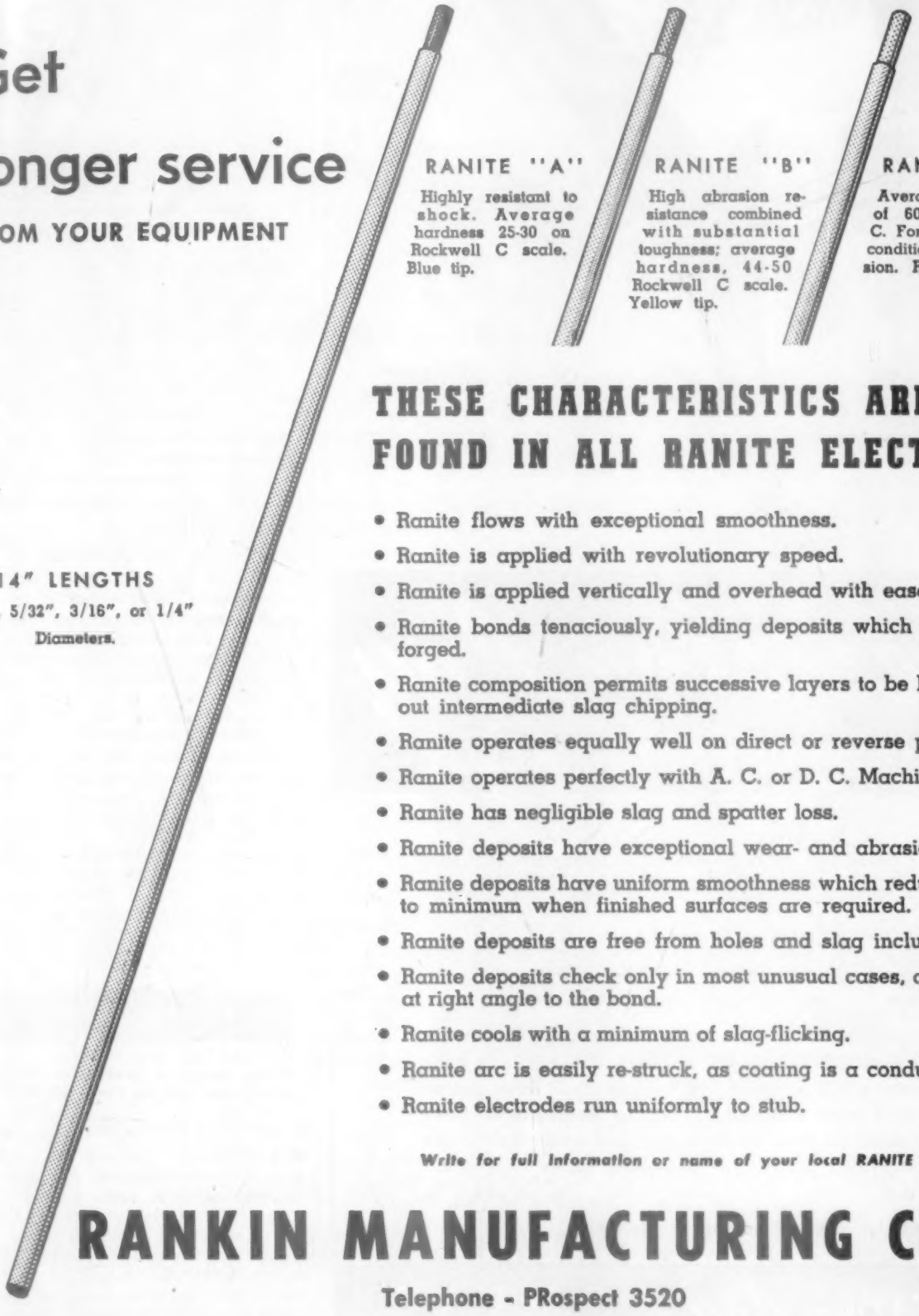
PIERCE GOVERNORS

HARD-SURFACE

with Smooth-flowing RANITE

Get longer service

FROM YOUR EQUIPMENT



RANITE "A"
Highly resistant to shock. Average hardness 25-30 on Rockwell C scale. Blue tip.

RANITE "B"
High abrasion resistance combined with substantial toughness; average hardness, 44-50 Rockwell C scale. Yellow tip.

RANITE "C"
Average hardness of 60-62 Rockwell C. For most severe conditions of abrasion. Red tip.

14" LENGTHS
1/8", 5/32", 3/16", or 1/4" Diameters.

THESE CHARACTERISTICS ARE FOUND IN ALL RANITE ELECTRODES

- Ranite flows with exceptional smoothness.
- Ranite is applied with revolutionary speed.
- Ranite is applied vertically and overhead with ease.
- Ranite bonds tenaciously, yielding deposits which may be hot-forged.
- Ranite composition permits successive layers to be built up without intermediate slag chipping.
- Ranite operates equally well on direct or reverse polarity.
- Ranite operates perfectly with A. C. or D. C. Machines.
- Ranite has negligible slag and spatter loss.
- Ranite deposits have exceptional wear- and abrasion-resistance.
- Ranite deposits have uniform smoothness which reduces grinding to minimum when finished surfaces are required.
- Ranite deposits are free from holes and slag inclusions.
- Ranite deposits check only in most unusual cases, and then only at right angle to the bond.
- Ranite cools with a minimum of slag-flicking.
- Ranite arc is easily re-struck, as coating is a conductor in itself.
- Ranite electrodes run uniformly to stub.

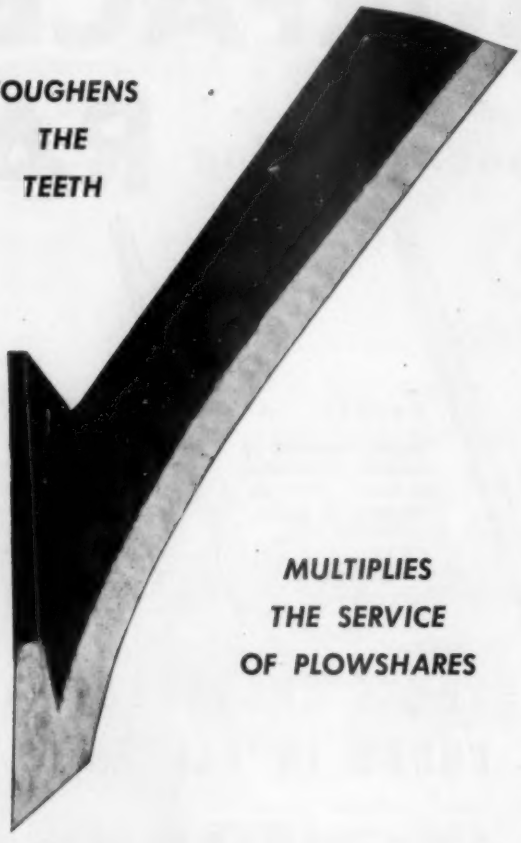
Write for full information or name of your local RANITE Distributor.

RANKIN MANUFACTURING CO.

Telephone - PRospect 3520

1403-05 West Washington Blvd. Los Angeles 7, California

TOUGHENS
THE
TEETH



SEPARATOR
CYLINDER
TOOTH

MULTIPLIES
THE SERVICE
OF PLOWSHARES

Resisto-Loy

HARD-SURFACING ALLOY

Use ISOROD or RESISTO-LOY alloys to put a hard, sharp cutting edge or tough face on general agricultural equipment.

They are easily applied and are unsurpassed for building up separator cylinder teeth, disc plows and harrows, cultivator points, bean knives and feed mill hammers.

Tests indicate that plowshares and separator teeth hard-faced with ISOROD or RESISTO-LOY along cutting edge and point stand up under five times as much wear and do their jobs more efficiently. Surfaces treated with these alloys resist the most severe usage, and retain their shape and sharpness long after untreated edges and points wear dull.

Write for name of nearest distributor.

Resisto-Loy COMPANY
GRAND RAPIDS 7, MICHIGAN

"Metco" Type 3E high-speed gun for production metal-spraying jobs.

Metallizing Gun

★ The "Metco" Type 3E metallizing gun was specially engineered for high-speed production spraying of low-melting-point metals such as zinc, tin, lead, solder, babbitt, cadmium and fine gauge copper alloys. Typical applications include corrosion-resistant coatings on iron and steel structures, water- and chemical-resistant linings for storage tanks and degreasers, conductive and soldering surfaces on glass, plastic and carbon products.

Using ⅛ in. wire of the desired metal or alloy, this new gun is said to make possible the following rates of deposition in pounds of metal per hour: zinc, 40; tin, 70; lead, 110; solder, 90; babbitt, 75. Any spraying speed within the prescribed range may be automatically obtained and maintained by the patented controlled-power unit. Other features are a universal gas head which allows the gun to be operated on any commercial gas—in conjunction with oxygen and compressed air—and a duplex mounting fixture for permanent installation on the production set-up.

Owners of "Metco" Type E or 2E guns may have their present equipment converted to Type 3E and converted back again should this be desired at a later date. **Metallizing Engineering Co., Inc.**, 38-14 30th St., Long Island City 1, New York.

» «

Burndy water-seal terminal for single-conductor cables from No. 4 to 2,000,000 cir mil.

Water-Seal Connectors

★ The Burndy "Hysealug" is designed to provide a watertight seal for cable ends. These connectors are made from silver-plated copper. The barrel is indented onto the conductor while the shroud is being compressed over insulation to form a watertight cable-end seal. A hydraulic press performs both operations simultaneously for cables up to 1,000,000 cir mil. **Burndy Engineering Co., Inc.**, 107 Bruckner Blvd., New York City 54.

Just in case you've eased up... ON YOUR PAY ROLL PLAN

Pause one brief moment. Compare your lot—and that of the men and women in your employ—with the lot of the infantrymen who meet the enemy face to face, who do the hardest fighting, who suffer the most casualties.

Let the full impact of war's unending grimness swiftly convert any tendency toward complacency into revitalized urgency. Remember—the war is not yet won.

As top management and labor, you've been entrusted with two major responsibilities—steadily maintained production, and steadily maintained War Bond Sales *through your Pay Roll Savings Plan.*

Decide *now* to revitalize your plant's Pay Roll Plan. Have your Bond Committee recheck all employee lists for percentages of participation and individual deductions. Have Team Captains personally contact each old *and new* employee. Raise all percentage figures wherever possible.

Don't underestimate the importance of this task. This marginal group represents *a potential sales increase of 25% to 30% on all Pay Roll Plans!*

Your success will be twofold: A new high in War Bond Sales; and a new high in production. Because a worker with a systematic savings plan has his mind on his work—not on post-war financial worries. He's taking care of the future now. His own. And his Country's future. *Help him!* REVITALIZE YOUR WAR BOND PAY ROLL SAVINGS PLAN.

Official U. S. Coast Guard Photo: The elevator to a Coast Guard-operated transport hospital

Back the Attack! SELL MORE THAN BEFORE!

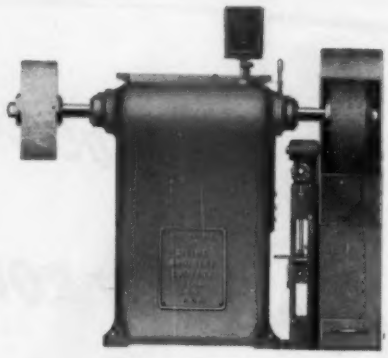
The Treasury Department acknowledges with appreciation the publication of this message by

THE WELDING ENGINEER

This is an official U. S. Treasury advertisement—prepared under the auspices of Treasury Department and War Advertising Council.

Abrasive-Belt Polisher

★ The VCS-DBX lathe with DBX backstand is a light duty unit for grinding and polishing. It is featured by self-aligning bearings, automatic V-belt tension adjustment, conveniently located starter, pressure-lubricated bearings, a handy tray for small tools and an enclosed motor protected from dust and dirt in a ventilated base. Right hand backstand and hood (see illustration) are standard, but left hand backstand and hood can be furnished, if desired, to make both sides usable for abrasive belt polishing. For flat surface polishing and grinding, hoods with hinged top covers and built-in platens can be furnished. **Divine Brothers Co.**, 102 Whitesboro St., Utica, N. Y.



VCS-DBX abrasive belt-polishing machine with right hand backstand and hood.

Ask for CMD WELDERS' CHIPPING HAMMERS

A type for every weld cleaning need. Cutting edges stay sharp a long time. Write Department 4W for descriptive circular now!

TYPE CB
Triple Duty
Combines 3 tools in 1—drift, chisel, and removable wire brush.

TYPE A
Drift and Chisel
Made from high-grade tool steel. Especially popular in malleable iron and grey iron foundries for general chipping.

TYPE C
Drift and Chisel
Same as Type CB but without brush.

CHICAGO MANUFACTURING AND DISTRIBUTING COMPANY
1928 WEST 46th ST., DEPT. W., CHICAGO 9, ILLINOIS

Respirator

★ Unique in design, Pulmosan's AL-400 airline respirator is all aluminum in construction with a patented air-tight rubber face cushion and the "Face-Fit" body which makes Pulmosan respirators adjustable by each wearer to his own facial contour. Dual air-supply tubes pass around the neck and connect with the main air-supply tube, which has an individual air filter. A reduction valve makes possible minute adjustments in air flow. Instantaneous severance of the unit from the main air supply can be effected by use of the break coupling. A web belt is furnished to support the respirator and allow unrestricted movement of the head and body.

Pulmosan AL-400 respirator.

The AL-400 was originally designed for use under welding helmets to protect operators from obnoxious fumes, dusts and vapors. Manipulation of the reduction valve permits excess air to be exhausted through the exhalation valve, creating a cool cushion of air under the helmet. **Pulmosan Safety Equipment Co.**, 176 Johnson Street, Brooklyn.

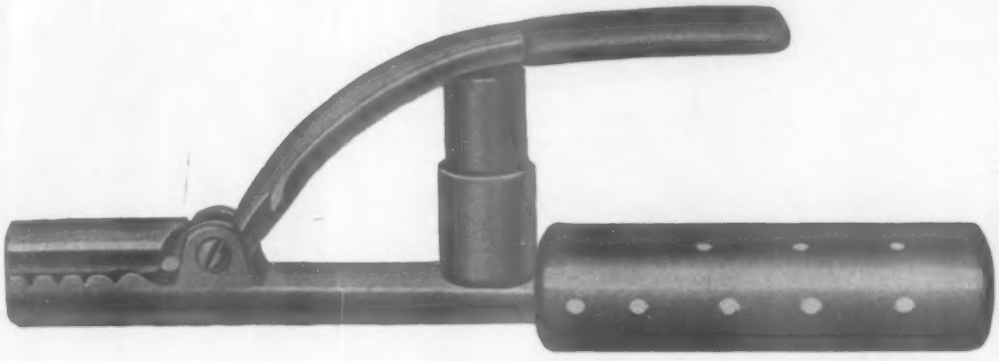
» «

Steel Hardening Solution

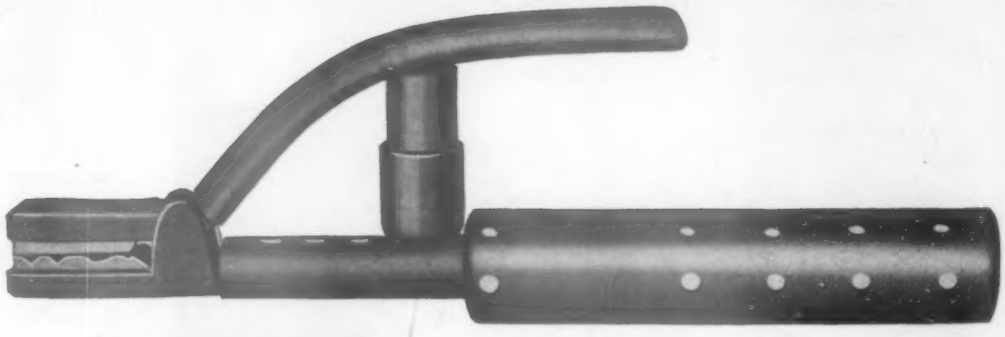
★ A new steel hardening solution called "Super Temp" has been introduced as a companion to "Steel Temp," announced some months ago in THE WELDING ENGINEER. The new chemical quenching solution is said to impart instant maximum hardness but at a sacrifice of toughness as the part or tool may achieve glass hardness. For this reason, "Super Temp" is not recommended for shock or impact tools. It can be successfully used, however, for the hardening of cutting tools that operate with a rotary or uniform motion—milling cutters, boring tools, reamers, broaches, twist drills, keyway cutters, etc. It is also serviceable for the hardening of the wearing parts of industrial machinery—gears, pinions, axles, shafting and other maintenance parts—especially when abrasion or friction enters the picture. **Steeltem Chemical Co.**, 51 East 42nd St., New York City 17.

THERM-ARC ELECTRODE HOLDERS

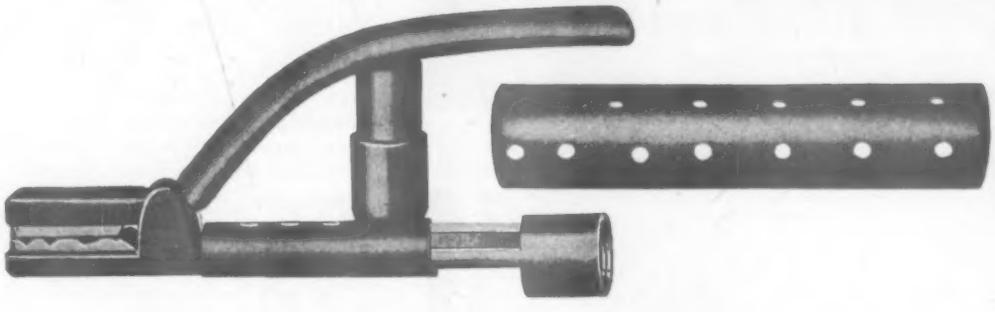
A Type of Holder that has Proven Itself
The only fully-insulated coil spring holder



TYPE N
Partially Insulated



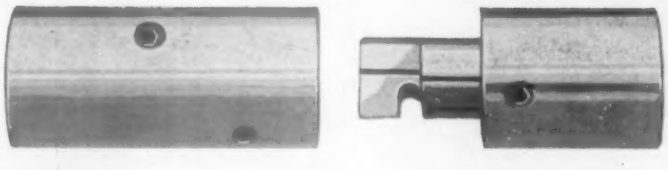
TYPE K
Completely Insulated



TYPE M
Detachable Completely Insulated With Removable Front

THERM-ARC CABLE CONNECTOR

This unit can be connected or disconnected quickly by a very short turn. The action is instantaneous and a tight, contacting connection is assured throughout entire circumference of male plug; no possibility of loosening while in use.



Write for our attractive, illustrated, descriptive booklet of THERMEX Holders and Cable Connectors.

THERMEX EQUIPMENT COMPANY

2045 Celia St. **Tel. TYler 7-1337**

DETROIT 8, MICH.

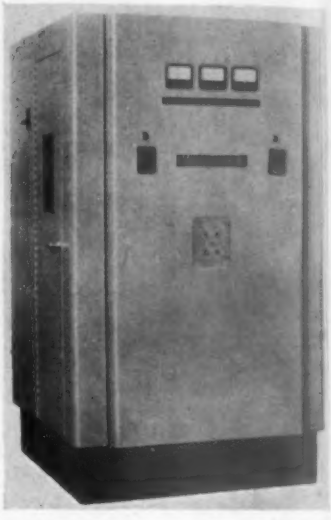
Electronic Regulator

★ A new voltage regulator for use with most G-E resistance-welding controls that include the phase-shift method of heat control has been announced by the **Industrial Control Division of the General Electric Co.**, Schenectady. The new regulator is designed to hold a constant welding current automatically regardless of line-voltage variations of as much as plus 10 or minus 20%. Known as the CR7503-D157, it consists of a resistor circuit connected to the power source and an electronic circuit. The latter not only holds the average voltage of the resistor current constant but also changes, electronically, the phase-control voltages of the main welding control panel, thereby automatically holding the welding current constant within close limits.

This regulator can be used on welding circuits with power factor from 20 to 70% and can be operated from 230/460/575 volts on a 50/60-cycle power supply. It operates whether or not the welding current is flowing—a feature said to enable it to compensate for a sudden voltage drop in less than three cycles.

G-E CR7503-D157 electronic voltage-regulating compensator for resistance-welding controls.

» «



"Megatherm" induction heating unit. It may be used for brazing and silver soldering applications and also for surface hardening of such parts as bearings, cam faces, gear teeth.

Induction Heating Unit

★ The new 25 kw "Megatherm" induction heating unit can be used both for high-speed surface hardening of bearing surfaces, etc. and for brazing and silver soldering applications. Using frequencies between two and five million cycles per second, this equipment is said to make possible the effective and speedy heating of steel, brass, copper and aluminum alloy pieces. The heating fixture is a simple coil of from one to five turns, which can be readily constructed from standard copper tubing.

The unit is designed to deliver 25 kw of output continuously at frequencies adjustable within the two to five million cycle range. The overall efficiency is guaranteed to equal or exceed 50%; *i. e.*, more than half of the total energy drawn from the power line appears as heat in the work piece. The power factor is stated to be 95%. **Industrial Electronics Division, Federal Telephone and Radio Corp.**, Newark 1.

» «

Plug Gauge Blank Sets

★ The new "Atlantic Emergency" set of 36 cylindrical plug gauge blanks (in steps of 1/16 in.) will permit a shop to produce any size of plug gauge from 0.029 to 1.000 in. with just a few minutes work on a cylindrical grinding machine. It is only necessary to grind the blanks to produce a commercial-finish gauge. **George Scherr Co.**, 200 Lafayette St., New York City 12.

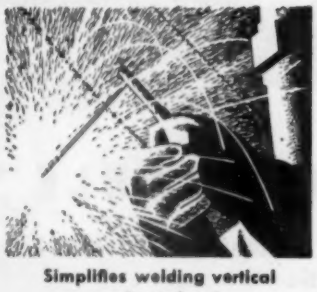
Revolutionary Hy-cycle Automatic Arc Provides Complete Control of Arc and Heat

At last, a development that automatically starts the arc before the welding electrode actually comes in contact with the work! Eliminating the "pecking" or "scratching" that so often creates tension and operator fatigue. Its many advantages contribute largely to saving time and labor because an operator can be trained in far less time than usual, and higher speeds can be obtained. This hy-cycle automatic arc unit, called "Missing Link," permits the operator to weld with any welding rod, bare steel or alloy. Rods that could not be used before can be burned with ease—such as bare mild steel, dust coated, reverse polarity, aluminum, bronze, stainless steel, etc., AC or DC.

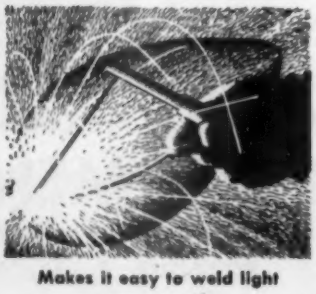
One of its most important advantages is welding light gauge. Light gauge requires low heat—making many jobs almost impossible for ordinary methods. Since the "Missing Link" starts automatically on as low as one ampere of heat, the welding of light gauge sheet can be done with surprising speed with no time out for "pecking" and "sticking."

You all know that our fighting men need the finest quality materials that we here at home can produce. That goes for Wrigley's Spearmint Gum, too. Although our stock pile of quality raw materials is getting lower and lower we are maintaining our standards of quality. Naturally, we are forced to limit production. So we are giving priority where it is needed most—and where you want us to—our fighting men and women overseas only. Because chewing gum is essential to them—they are getting all of our limited production of Wrigley's Spearmint Gum.

You can get complete information from Mid-States Equipment Company, 2429 S. Michigan Ave., Chicago 16, Ill.



Simplifies welding vertical and overhead



Makes it easy to weld light gauge work

Y-133

More and More

in Important Places

UNITED

MERCURY RECTIFIER
and
GRID CONTROL TUBES

for Resistance Welding

These features make UNITED Tubes better

1. Protruded filament, mounted on a vertical plane, increases emission area and affords greater capacity to withstand vibration and shock.
2. Greater shielding than is found in ordinary tubes permits proper thermal radiation for extended tube life.
3. Ideal relation between condensed mercury and ambient temperature is maintained.
4. Heavy duty quality is emphasized in all component parts and construction.

It is obvious, from the illustrations of these UNITED Tubes, that they are built to withstand the continuous hard uses of industrial applications in contrast to tubes designed to function under the less stringent conditions of radio communication.

TYPES ILLUSTRATED: The UNITED types illustrated will interchange with and replace other type tubes as follows:

USE UNITED	TYPE	967		to replace		FG-17
" "	"	972-A		"	"	872-A
" "	"	UX-973		"	"	——
" "	"	973	(Not illustrated)			873

UNITED ELECTRONICS COMPANY

Newark 2 New Jersey

Colored Fluxes

★ A distinctive feature of "Kre-Co Multichemic" fluxes is the use of color for quick identification: pink for aluminum brazing, blue for aluminum welding, green for brazing powder, brown for cast iron and purple for brazing paste. Positive identification is thus assured.

For welding sheet, cast and extruded aluminum and aluminum alloys the blue aluminum welding flux is used. This product is said to have good ability to dissolve the rapid-forming aluminum oxides which appear during the welding process.

The pink aluminum brazing flux is used for applications in which a temperature below the melting point of aluminum has to be employed. A standard 5% silicon rod can be used with this flux.

The green brazing powder is used for brazing steel, cast iron, malleable iron, bronze, brass, copper and copper alloys.

The purple brazing paste is a new flux designed for rapid application to speed mass-production methods of brazing both ferrous and non-ferrous metals and their alloys. It is also suitable for use with nickel-silver rod.

The cast iron flux is used for welding cast iron, steel castings and malleable-iron castings. It is said to have quick acting, cleansing properties that insure a rapid flow of the welding alloy.

Kre-Co. Multichemic Flux Division of Charles W. Krieg Co., Newark.

» «

"Steelgrip" No. 13997.

Reinforced Finger Grip

★ The standard thumb and two-finger guard made by **Industrial Gloves Co.**, Danville, Ill., has been reinforced with vertically staggered steel ribbons. These give additional protection against cuts and abrasions when the wearer is handling sharp or jagged-edged objects.

» «

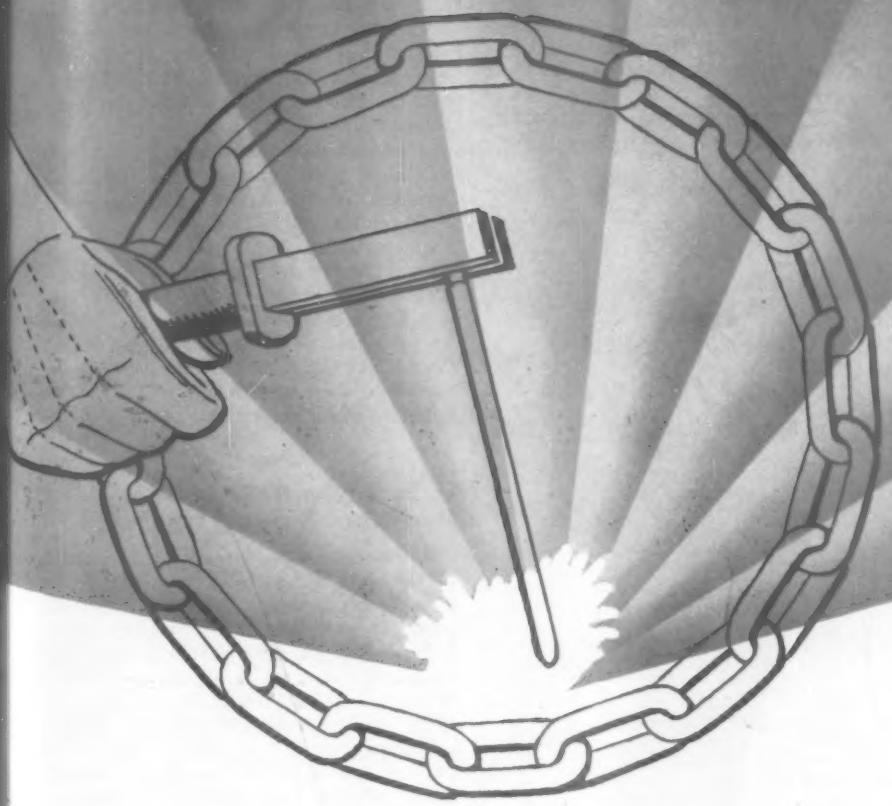
"Looks" goggles. Both lenses and frame are made of lightweight plastic.

All-Plastic Goggles

★ Featuring light weight, wide vision and comfort, the new clear-plastic goggles, "Looks," are suited to either men or women workers. The lenses are of polished sheet acetate, clear or green, and can be inexpensively replaced. The plastic frame is available either in a General Purpose Model, providing direct ventilation through holes at the top and bottom of eye cups, or in a Dust Model with indirect ventilation through serrated lens seats. A wide elastic headband holds the goggles in place at low tension. The large, "aviation-type" lenses afford a wide, unobstructed angle of vision. Further details can be obtained in Bulletin No. CE-25, available from **Mine Safety Appliance Co.**, Braddock, Thomas and Meade Streets, Pittsburgh 8.

GRIND DOWN
HEAVY BEADS Quicker!
USE SKILSAW
PORTABLE GRINDERS!
● SKILSAW PORTABLE GRINDERS deliver top load speed, even when the going is toughest. That's why they grind down heavy beads, studs and fins faster and easier. They're quality-built throughout, with special ball-bearing inserts to absorb vibration and spindle thrust. That's why SKILSAW PORTABLE GRINDERS run cooler, and last longer with less time out for servicing.
You'll save time, money and man-power on all heavy grinding with SKILSAW PORTABLE GRINDERS. Ask your distributor to show you on your own work.
SKILSAW, INC.
5033-43 Elston Ave., Chicago 30, Ill.
Sales and Service Branches in All Principal Cities
SKILSAW PORTABLE ELECTRIC TOOLS
MAKE AMERICA'S HANDS MORE PRODUCTIVE

NOW you can GET these McKay Welding Electrodes



These Commercial Grades of Stainless and Mild Steel Welding Electrodes are now available.

McKAY STAINLESS STEEL ELECTRODES

(All Diameters .075"* to 1/8")

18-8, Type 308
18-8 Cb., Type 347
18-8 Mo., Type 317
25-12, Type 309
15-35, Type 330
15-60
25-12, Type 309
25-20, Low Carbon-Heat Resistant

STRAIGHT CHROMIUM

4-6 Cr., Type 502
12 Cr., Type 410
16 Cr., Type 430
18 Cr., Type 442
28 Cr., Type 446
TOOL AND DIE

McKAY MILD STEEL ELECTRODES

(All Diameters 3/32"* to 5/16")

No. 16—A.W.S., E-6020 & E-6030
No. 15—A.W.S., E-6010
No. 17—A.W.S., E-6012
No. 116—A.W.S., E-6012 & E-6013
No. 3—A.W.S., E-4520 in straightened and cut lengths or coil form for automatics
No. 19—Cast Iron

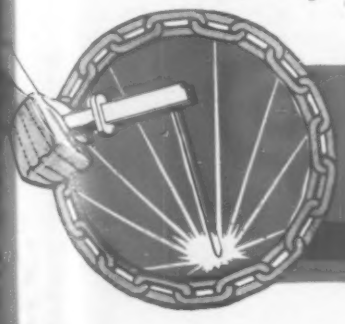
*We can now give good service on orders for small sizes such as—.075" and 3/32", formerly so hard to get, because of recent increases in our capacity for producing the smaller diameters.

An easing supply situation now makes McKay Stainless and Mild Steel Electrodes available for commercial purposes. A list of these two grades for nearly every type of arc welding, appears at the right.

If you have been having trouble obtaining the Electrodes you require, here is an opportunity to get these grades from The McKay "researched line." Inventories are being gradually built up which should permit a more consistent supply of most of these analyses both now and in the future.

Your inquiry or order will receive prompt attention.

General Sales Office: York, Pa.



THE McKAY COMPANY
PITTSBURGH, PA.

WELDING ELECTRODES . . . COMMERCIAL CHAINS . . . TIRE CHAINS

News of the Industry

Linde Offers New Films for Training Gas Weldors

One of the best ways to prepare new workers in the field of oxy-acetylene operations for their specific tasks seems to be through the medium of visual step-by-step instruction in the basic procedures of welding and cutting. Bearing this in mind, The Linde Air Products Co. has undertaken the preparation of an elementary course of instructions designed to speed up training programs.

The material in this course is presented through the combination of a series of slide films and a series of corresponding printed student instructions in a loose-leaf binder. These are arranged into three general groups, each containing several lessons, as follows:

The "C" series covering manual and mechanized oxy-acetylene cutting.

The "W" series covering oxy-acetylene welding.

The "S" series covering safety practices in the care and use of oxy-acetylene equipment.

Twenty Linde slide films and accompanying literature are now completed and ready for distribution. They are available at any office of The Linde Air Products Co. at a price of $3 per teaching unit—each unit consisting of one 35 mm slide film, 25 students' lesson booklets and 3 instructors' supplements.

» «

Welding Distributors Ass'n. Directors Meet in Detroit

Measures designed to help cushion the shock that is expected to come with the reconversion period were adopted by directors of the Welding Distributors Association attending a recent meeting at the St. Clair Inn, Detroit. Inventory controls, overstock, surplus equipment and servicing of national accounts were all discussed against a background of what the return to a peacetime basis will mean to the distributor of welding equipment.

Those attending the meeting included T. A. Jones, president of the association and president of the Arcway Equipment Co., Philadelphia; Mort Cobb, vice-president of the association, Welding Engineering Sales Corp., New York City; W. H. Simmons, treasurer of the association, Welding Sales and Engineering Co., Detroit; F. P. Kohlbry, president of the Machinery and Welder Corp., St. Louis, and Allan W. Gordon, executive secretary of the Welding Distributors Association, St. Louis.

» «

F. E. Taylor Tells Postwar Resistance Welding Outlook

A bright future for resistance-welding processes in the postwar era was foreseen in a recent statement by Floyd E. Taylor, president of the Resistance Welder Manufacturers' Association, 505 Arch St., Philadelphia 6. Among the types of products he cited in which resistance-welding processes are progressing rapidly are: radios and other electrical appliances, small items such as optical frames, watches, vacuum tubes, alloyed wire fabrication, electrical devices of all types, jewelry, toys, novelties, cutlery, tools, hardware, etc.

"Actually, there are few types of metal products in which resistance-welding processes will not play increasingly important roles," said Taylor, who is connected with the Swift Electric Welder Co., Detroit. "The big point to remember, however, is that resistance welding is not something to be thought of at the last minute, just as products are about ready to be put into production. It scores its biggest economies and manufacturing improvements when the product itself is designed for welding."

» «

Burdett Acquires AISECO

Burdett Oxygen Company of Cleveland, Inc., has acquired the American Industrial Safety Equipment, Inc., Brooklyn, N. Y. The latter concern will now be known as the American Industrial Safety Equipment Div. of Burdett.

Lewis B. Ginsberg is general manager of the AISE Division, which will continue to be located at 397 Bridge St., Brooklyn 1.

Plenty of PUNCH in this Hard-Faced punch

After this punch was given a protective overlay of Coast Metals Hard-Facing, it was able not only to turn out several thousand more track links before showing signs of wear, but also to do better and cleaner work. Material and labor costs involved in welding the overlay on the punch were more than compensated for by the much longer punch life obtained.

Users of a wide diversity of machines, equipment and products who have enlisted Coast Metals Hard-Facing for making the working surfaces of new or old parts wear-resistant are reporting equally outstanding economies.

Write for a copy of our new pamphlet "Your Best Protection Against Wear" which goes into full detail.

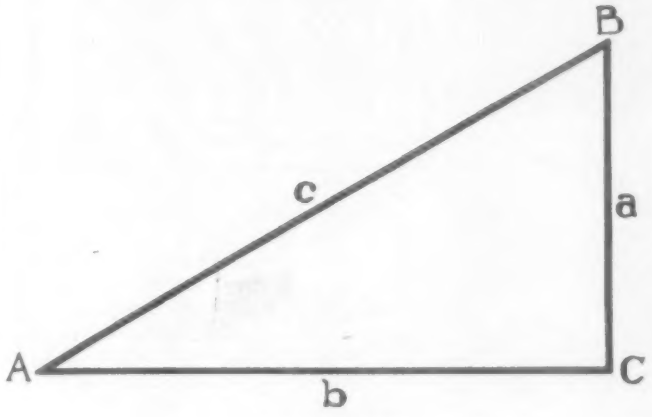
COAST METALS, INC.

Plant and General Offices: Canton 6, Ohio • *Executive Offices:* New York 19, N.Y.

COAST METALS hard-facing weld rods

MAKE YOUR EQUIPMENT LAST LONGER

Trigonometric Solutions of Right Triangles



Formulas

$$\text{Sine A} = \frac{\text{Perpendicular}}{\text{Hypotenuse}} = \text{Sine A} = \frac{a}{c}$$

$$\text{Cos A} = \frac{\text{Base}}{\text{Hypotenuse}} = \text{Cos A} = \frac{b}{c}$$

$$\text{Tan A} = \frac{\text{Perpendicular}}{\text{Base}} = \text{Tan A} = \frac{a}{b}$$

$$\text{Cosec A} = \frac{\text{Hypotenuse}}{\text{Perpendicular}} = \text{Cosec A} = \frac{c}{a}$$

$$\text{Sec A} = \frac{\text{Hypotenuse}}{\text{Base}} = \text{Sec A} = \frac{c}{b}$$

$$\text{Cot A} = \frac{\text{Base}}{\text{Perpendicular}} = \text{Cot A} = \frac{b}{a}$$

$a = c \text{ Sine A} = c \text{ Cos B} = b \text{ Tan A}$

$b = c \text{ Sine B} = c \text{ Cos A} = a \text{ Tan B}$

$\text{Side}^2 + \text{Perpendicular}^2 = \text{Hypotenuse}^2$

$$b^2 + a^2 = c^2$$

$$\frac{b^2}{c^2} + \frac{a^2}{c^2} = 1$$

$\text{Sine}^2 \text{ A} + \text{Cos}^2 \text{ A} = 1$ $\qquad \text{Tan A} = \dfrac{\text{Sine A}}{\text{Cos A}}$

$1 + \text{Tan}^2 \text{ A} = \text{Sec}^2 \text{ A}$

$1 + \text{Cotan}^2 \text{ A} = \text{Cosec}^2 \text{ A}$

Example

Find a, b and B of a right triangle when A = 30° 30′ and c = 10 in.

$\text{Sine A} = \dfrac{a}{c}$ $\qquad a = 0.50754 \times 10 = 5.0754$ in.

$\text{Cos A} = \dfrac{b}{c}$ $\qquad b = 0.86163 \times 10 = 8.6163$ in.

Angle B = 90° − A = 90° − 30° 30′ = 59° 30′

DEGREES	SINE	COSINE	TANGENT	COTANGENT	DEGREES
0° 00′	.00000	1.0000	.00000	infinity	90° 00′
30′	.00873	.99996	.00873	114.59	30′
1° 00′	.01745	.99985	.01745	57.290	89° 00′
30′	.02618	.99966	.02618	38.188	30′
2° 00′	.03490	.99939	.03492	28.636	88° 00′
30′	.04362	.99905	.04366	22.904	30′
3° 00′	.05324	.99863	.05241	19.081	87° 00′
30′	.06015	.99813	.06116	16.350	30′
4° 00′	.06976	.99756	.06993	14.301	86° 00′
30′	.07846	.99692	.07870	12.706	30′
5° 00′	.08715	.99619	.08749	11.430	85° 00′
30′	.09584	.99540	.09629	10.385	30′
6° 00′	.10453	.99452	.10510	9.5144	84° 00′
30′	.11320	.99357	.11393	8.7769	30′
7° 00′	.12187	.99255	.12278	8.1443	83° 00′
30′	.13053	.99144	.13165	7.5957	30′
8° 00′	.13917	.99027	.14054	7.1154	82° 00′
30′	.14781	.98901	.14945	6.6911	30′
9° 00′	.15643	.98769	.15838	6.3137	81° 00′
30′	.16505	.98628	.16734	5.9758	30′
10° 00′	.17365	.98481	.17633	5.6713	80° 00′
30′	.18223	.98325	.18534	5.3955	30′
11° 00′	.19081	.98163	.19438	5.1445	79° 00′
30′	.19937	.97992	.20345	4.9151	30′
12° 00′	.20791	.97815	.21256	4.7046	78° 00′
30′	.21644	.97630	.22169	4.5107	30′
13° 00′	.22495	.97437	.23087	4.3315	77° 00′
30′	.23344	.97237	.24008	4.1653	30′
14° 00′	.24192	.97029	.24933	4.0108	76° 00′
30′	.25038	.96815	.25862	3.8667	30′
15° 00′	.25882	.96592	.26795	3.7320	75° 00′
30′	.26724	.96363	.27732	3.6059	30′
16° 00′	.27564	.96126	.28674	3.4874	74° 00′
30′	.28401	.95882	.29621	3.3759	30′
17° 00′	.29237	.95630	.30573	3.2708	73° 00′
30′	.30070	.95372	.31530	3.1716	30′
18° 00′	.30902	.95106	.32492	3.0777	72° 00′
30′	.31730	.94832	.33459	2.9887	30′
19° 00′	.32557	.94552	.34433	2.9042	71° 00′
30′	.33381	.94264	.35412	2.8239	30′
20° 00′	.34202	.93969	.36397	2.7475	70° 00′
30′	.35021	.93667	.37388	2.2746	30′
21° 00′	.35837	.93358	.38386	2.6051	69° 00′
30′	.36650	.93042	.39391	2.5386	30′
22° 00′	.37461	.92718	.40403	2.4751	68° 00′
30′	.38268	.92388	.41421	2.4142	30′
DEGREES	COSINE	SINE	COTAN.	TANGENT	DEGREES

DEGREES	SINE	COSINE	TANGENT	COTANGENT	DEGREES
23° 00′	.39073	.92050	.42447	2.3558	67° 00′
30′	.38975	.91706	.43481	2.2998	30′
24° 00′	.40674	.91354	.44523	2.2460	66° 00′
30′	.41469	.90996	.45573	2.1943	30′
25° 00′	.42262	.90631	.46631	2.1445	65° 00′
30′	.43051	.90258	.47697	2.0965	30′
26° 00′	.43837	.89879	.48773	2.0503	64° 00′
30′	.44620	.89493	.49858	2.0057	30′
27° 00′	.45399	.89101	.50952	1.9626	63° 00′
30′	.46175	.88701	.52057	1.9210	30′
28° 00′	.46947	.88295	.53171	1.8807	62° 00′
30′	.47716	.87882	.54295	1.8418	30′
29° 00′	.48481	.87462	.55431	1.8040	61° 00′
30′	.49242	.87035	.56577	1.7675	30′
30° 00′	.50000	.86603	.57735	1.7320	60° 00′
30′	.50754	.86163	.58904	1.6977	30′
31° 00′	.51504	.85717	.60086	1.6643	59° 00′
30′	.52250	.85264	.61280	1.6318	30′
32° 00′	.52992	.84805	.62487	1.6003	58° 00′
30′	.53730	.84339	.63707	1.5697	30′
33° 00′	.54464	.83867	.64941	1.5399	57° 00′
30′	.55194	.83388	.66188	1.5108	30′
34° 00′	.55919	.82904	.67451	1.4826	56° 00′
30′	.56641	.82413	.68728	1.4550	30′
35° 00′	.57358	.81915	.70021	1.4281	55° 00′
30′	.58070	.81441	.71329	1.4019	30′
36° 00′	.58778	.80902	.72654	1.3764	54° 00′
30′	.59482	.80386	.73996	1.3514	30′
37° 00′	.60181	.79863	.75355	1.3270	53° 00′
30′	.60876	.79335	.76733	1.3032	30′
38° 00′	.61566	.78801	.78128	1.2799	52° 00′
30′	.62251	.78261	.79543	1.2572	30′
39° 00′	.62932	.77715	.80978	1.2342	51° 00′
30′	.63608	.77162	.82434	1.2131	30′
40° 00′	.64279	.76604	.83910	1.1917	50° 00′
30′	.64945	.76041	.85408	1.1708	30′
41° 00′	.65606	.75471	.86929	1.1504	49° 00′
30′	.66262	.74895	.88472	1.1303	30′
42° 00′	.66913	.74314	.90040	1.1106	48° 00′
30′	.67559	.73728	.91633	1.0913	30′
43° 00′	.68200	.73135	.93251	1.0724	47° 00′
30′	.68835	.72537	.94896	1.0538	30′
44° 00′	.69466	.71934	.96569	1.0355	46° 00′
30′	.70091	.71325	.98270	1.0176	30′
45° 00′	.70711	.70711	1.0000	1.0000	45° 00′
DEGREES	COSINE	SINE	COTAN.	TANGENT	DEGREES

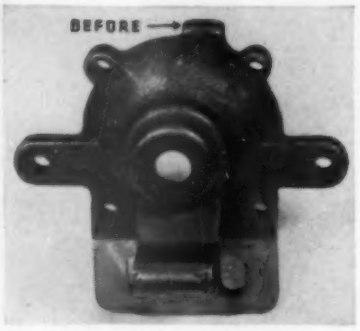
This engineering change on a gray iron casting was a cinch!

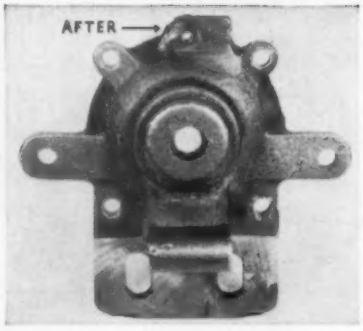
Learn this conservation process—it may mean thousands of dollars to you.

A CHANGE in design after hundreds of these gray iron castings had been machined called for a wider lug to accommodate another hole. A small deposit of PHILLIPS "600" Electrode brought the lug to the required size—then the hole was drilled and tapped through the line of fusion. This job was done by a contract shop for 15c per casting.

Similar savings are made every day with PHILLIPS "600" Electrode, which produces fully machinable deposits on cast iron. The process has been used for years in hundreds of foundries and machine shops.

All details are explained in our free manual of procedures for arc welding cast iron. Write for your copy TODAY.





C. E. PHILLIPS & COMPANY

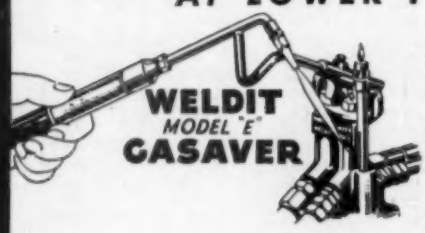
2750 POPLAR STREET
DETROIT 8, MICHIGAN

332 SO. JEFFERSON STREET
CHICAGO 6, ILLINOIS

MANUFACTURERS AND DISTRIBUTORS OF WELDING ELECTRODES AND SPECIALTIES

Safe Welding

AT LOWER PRODUCTION COSTS



The Weldit Gasaver shuts off the welding flame when not in use. . . . Conserves essential materials by cutting oxygen and acetylene consumption as much as *fifty* per cent. Prevents injury to workmen—or sudden fires—from dangerous idle torch flames. . . . Adjustment remains unaltered between welds.

When the Weldit Gasaver has been installed, you simply hang idle torch on the handy lever rod. Weight of torch pulls rod down, thus automatically shutting off supply lines. Relight instantly by passing torch over Gasaver pilot light. No bother. . . . No time lost. . . . *No readjusting required.* . . . Price $10.00 at Detroit. Order today.

Better Soldering, Annealing and Heating Jobs

The Weldit Model CW Blowpipe is in daily use by many foremost industrial plants. . . . Built in accordance with the recommendations of leading fabricators of sheet metal products. . . . Operates on either natural gas, manufactured gas, or other low temperature fuel gas and compressed air. Stands up under rough shop use. . . . Send for literature.

WELDIT ACETYLENE CO.
628 BAGLEY AVENUE · DETROIT 26, MICH.

Red Cards Curb Absenteeism at Lincoln Electric Plants

A low absentee rate of 1½ to 2% is attributed by The Lincoln Electric Co., Cleveland, primarily to its much-publicized incentive system. Since an absent or tardy worker detracts from the efforts of others in his production team, special pains are taken to investigate and cure the causes.

A simple but effective system is employed. At 20 minutes after starting time, all time cards which have not been picked up by employees at the main entrance are taken to the personnel office. Each card removed from the rack is replaced with a red card.

When the employee comes in, either late or on the next day, he must hand in the red card at the personnel office in order to secure his regular time card. This gives the personnel office the opportunity to question him and find out what is wrong. The pertinent data are then entered on the red card for permanent reference.

In the event of any rising trend of unnecessary absenteeism in a department, the matter is brought before the advisory board, which is composed of one elected member from each department, an elected foreman from each plant, two elected office representatives and two elected representatives of women workers. Meeting with the general manager, two superintendents and the personnel director, the advisory board plays an important part in the operation of the Lincoln incentive system and other matters affecting workers' welfare.

» «

Ampco Metal Opens West Coast Plant

In order to improve delivery and technical advisory service to its west coast customers, Ampco Metal, Inc., has built a completely equipped new plant at 30 East Burbank Blvd., Burbank, Calif. The plant is in charge of the same personnel that formerly managed the company's previous west coast manufacturing facilities in Hollywood; namely, E. H. Wilson, works manager; P. P. Bergmann, plant superintendent; O. D. Cooper, field service engineer, assisted by L. C. Dean.

The new plant will produce Ampco metal by both the centrifugal and the sand-cast process. Extruded and other wrought products, manufactured only at the home plant in Milwaukee, will also be stocked at Burbank.

» «

AIEE Hears Solution of Resistance-Welder Problem

Arthur C. Johnson, electrical research engineer of the Edward G. Budd Mfg. Co., Philadelphia, presented a discussion paper, "The Design of Low-Voltage Welding Power Distribution," before the recent annual meeting of the American Institute of Electrical Engineers at St. Louis. This paper presented a solution to the problem of the low-voltage feeder, one of the vital constituents of a-c resistance-welder power supply. It was prepared jointly by Mr. Johnson, by Dr. Comfort A. Adams, consulting engineer, and by John R. Fletcher, superintendent of Budd's methods and equipment department.

ARMY
E
NAVY
"... This is your nation's tribute to your patriotism and to your great work in backing up our soldiers on the fighting front."
Under Secretary of War

Serving the Armed Forces

MOBILE OXYGEN GENERATOR

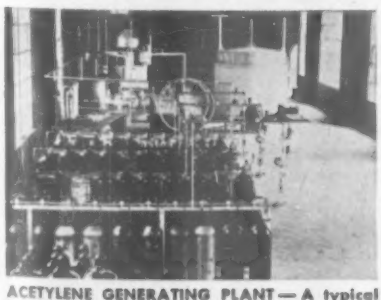
MOBILE HYDROGEN GENERATOR

WE WERE called upon to design and build a portable Oxygen Generator. In a short time Independent Engineers completed the first Mobile Oxygen Generator capable of producing 99.5% pure oxygen and charging high pressure oxygen cylinders in the field.

There are now many of these Mobile Oxygen Generators supplying oxygen to our Armed Forces in all theaters of this war.

WE WERE also called upon to design and build a portable high pressure Hydrogen Generator. This was the first portable high pressure Hydrogen Generator capable of producing hydrogen and charging high pressure cylinders in the field.

OXYGEN GENERATOR—This is a view of a typical commercial Oxygen Generator installation in operation. This plant produces 750 cubic feet per hour and up of 99.5% pure oxygen.



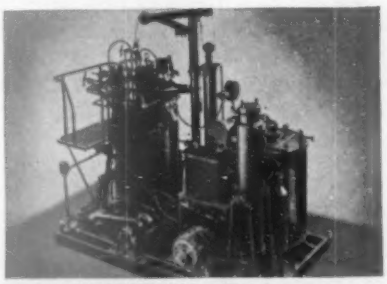
ACETYLENE GENERATING PLANT — A typical installation of our continuous generator and charging plant.

After Victory....

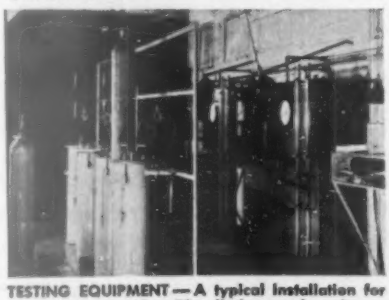
We will be building Oxygen and Hydrogen Plants for commercial users; also, Acetylene Generating Plants, High and Low Pressure Cylinder Testing Equipment, Acetylene Cylinders, etc.

We will be glad to go over your requirements and assist you in any way possible. If you are directly or indirectly serving the Armed Forces, it may be possible to obtain this equipment now. Address your inquiries to Sales Engineer, Department W.E.

INDEPENDENT ENGINEERING CO.
INCORPORATED
O'FALLON ILLINOIS



HYDROGEN GENERATOR — This is our compact Single Generator, High Pressure Hydrogen Plant. This generator produces 2500 cubic feet per hour of Hydrogen at 2500 lbs. pressure and charges cylinders direct.



TESTING EQUIPMENT — A typical installation for testing between 40 to 50 cylinders per hour in our testing department.

TITAN Recommends

4 SIMPLE RULES FOR EFFICIENT WELDING

Strong, sound welds can easily be made. The use of TITAN Brass Welding Rods in line with these four principles will assure welds that are ductile and uniform.

1. Clean weld areas by removing foreign matter such as grease, rust, oil and scale. Surfaces to be welded, when roughened by chipping, give better adhesive qualities. Vee welds when practical are recommended for repairing steel and cast iron parts.

2. Use a good prepared flux. If this is not available, 7 parts of boric acid mixed with 3 parts of calcined borax will prove satisfactory.

3. The section to be welded should be brought to a dull red heat. Heat the welding rod uniformly with a neutral or slightly oxidizing flame and dip it into the flux. The heated end of the rod is then melted on to the preheated section. The bronze will flow away in an even layer and give a good "tinning" coating. Keep building up the section by melting successive layers of rod, holding the inner cone of the flame about ¼" from the puddled surface.

4. Bronze rods and welds should not be brought beyond a dull red heat because they can be burned by overheating.

TITAN'S doubly deoxidized bronze welding alloys penetrate seams and crevices readily. They are the favorite with welders who know the importance of uniformity. Try them today and you will demand them tomorrow.

Titan

METAL MANUFACTURING CO., BELLEFONTE, PA.

NEW YORK • CHICAGO • SAN FRANCISCO

Quality Alloys By Brass Specialists

Brass and Bronze Rod • Forgings • Die Castings • Welding Rods

Steel Barrel Plant Changes Ownership

Rheem Mfg. Co. has acquired the Atlas Steel Barrel Division of Bethlehem Steel Co., Bayonne, N. J. Rheem is a large manufacturer of steel containers and of a wide variety of ordnance and aircraft materials. The new acquisition brings the total of Rheem plants to fourteen, located in nine states.

Robert Campbell, president of Atlas Steel Barrel Corp. before its acquisition by Bethlehem and since then manager of the plant, will become a vice-president of the Rheem company.

» «

Navy Releases Two Films for War Plant Showings

Two new combat films, *The Black Cats* and *LST*, are now available for exclusive showings to war workers, according to the Industrial Incentive Division of the U. S. Navy. Both may be obtained in either 16 or 35 mm sizes.

Produced in the South Pacific, *The Black Cats* is an authentic film report of the Catalina patrol bombers. Flying through thunder, lightning and a lively squall, the "Black Cats" strike at night like vengeful eagles on the hunt. An exciting operational flight against a Jap convoy was caught by Navy cameras.

The birth of the "cornfield Navy" is depicted in the other film. *LST* shows how the LST's—landing ship tanks—were assembled in former cow pastures and cornfields, built by men and women who dwell and work far from the sea.

» «

Nominate J. F. Lincoln, Cleveland Hall of Fame

The Carter Hotel in Cleveland has for the past month or so been displaying in its main lobby a drawing of some prominent Clevelander under the heading "Cleveland Hall of Fame." Recently, James F. Lincoln, president of the Lincoln Electric Co., was selected for the honor.

The idea of the Cleveland Hall of Fame was originated by Allen James Lowe, managing director of the hotel, and the portraits are the work of his wife, assistant manager Mary D. Burger. It was Mr. Lowe's desire to select each week a person who is not only a typical representative of Cleveland but also one who stands for the principles of a progressive America.

» «

Ergolyte Opens Plant to Do Contract Welding

Ergolyte Mfg. Co., manufacturer of a-c arc welders and other welding equipment, has opened a new plant at 3231 North Lee St., Philadelphia, solely to do contract welding. Edmund L. Brown has been named plant superintendent.

Work at the new plant is at present being devoted to the construction of landing barge ramps used on the Navy's LCVP's and to electric and gas welding on machine gun mounts and rocket launchers, according to John H. Read, president of the company.

SALVAGE DEFECTIVE ALUMINUM CASTINGS

THIS NEW, FAST, EASY WAY—ASSURES PERFECT FILL-INS EVERY TIME

LOW TEMPERATURE ELIMINATES STRESSES AND DISTORTION

PATENT PENDING

THE NEW

Mogul Nervous Weld Pistol and Machine

Mogul Nervous Weld Machine is a compact enclosed unit with finger tip one dial control. Operation shows repair of cracked cylinder block by this remarkable process.

SALVAGE BRONZE, GREY IRON, MALLEABLE AND STEEL CASTINGS

This revolutionary Mogul Nervous Weld Process now makes possible for the first time a positive repair of defective aluminum castings so perfect that even photomicrographs fail to show the line of demarcation. You can add aluminum to castings, patterns and filled in aluminum can be drilled and tapped.

Castings reclaimed by this amazing process machine perfectly and permit alumilite plating without hydrogenization taking place on the filled-in area.

The fusion is so perfect with the Mogul Nervous Weld Pistol that the build-up resembles that of the original casting. Further, the aluminum deposit is so dense at the point of fusion that there is no apparent line of demarcation.

Bronze, Grey iron, Malleable and Steel Castings can be reclaimed with equal success.

Mogul Nervous Weld is a proven process and it is already saving foundries and machine shops time and money by doing the impossible jobs perfectly.

Defective area broken through in machining.

Same Area, Mogul Nervous Welded, unfinished.

Reserve your copy of the 4-page Mogul Nervous Weld Process and Equipment Bulletin. Other applications also described in this valuable brochure. Write for it today.

METALLIZING COMPANY OF AMERICA

Executive Offices: 1333 W. Congress St., Chicago • 1351 E. 17th St., Los Angeles • 135 Cedar St., New York

ABOUT PEOPLE

Enoch H. Turnock, Jr., engineer on welding electrode development, Westinghouse Electric and Mfg. Co., East Pittsburgh, was one of eight men chosen to receive the company's highest honor for distinguished service in war production. Mr. Turnock was presented with a bronze plaque and the Westinghouse Order of Merit by A. W. Robertson, chairman of the board of directors. The citation accompanying his award read: "For his contributions to the development of welding electrodes."

» «

B. J. Trautman has been appointed manager of works of the Hammond, Ind., plant of the Pullman-Standard Car Mfg. Co. He had been acting manager since last March. Mr. Trautman came to Hammond in 1940 as chief engineer to help in the production of medium tanks, invasion mortars, 155 mm shells and howitzer carriages. Shortly afterwards, he became assistant manager of works.

» «

Alex D. Bailey, vice-president of the Commonwealth Edison Co., Chicago, is the official nominee for the 1945 presidency of the American Society of Mechanical Engineers. Vice-presidents selected by the ASME nominating committee are: **David Larkin,** vice-president and general manager of the Broderick and Bascom Rope Co., St. Louis; **John E. Lovely,** vice-president, Jones and Lamson Machine Co., Springfield, Vt.; **Thomas S. McEwan,** vice-president, McClure, Haddon and Ortman, Inc., St. Louis. Nominated as managers are: **Daniel S. Ellis,** vice-president in charge of manufacturing, Lima Locomotive Works, Inc., Lima, O.; **Arthur J. Kerr,** district manager of sales, Pittsburgh Equitable Meter Co., Tulsa, Okla.; **Herman George Thielscher,** mechanical engineer, Potomac Electric Power Co., Washington, D. C.

» «

Dudley Rice has just been appointed a field engineer in the Chicago district of the Eutectic Welding Alloys Co. and will make his headquarters at 53 West Jackson Blvd., Chicago 4. Mr. Rice was formerly a sales specialist on the welding products of the American Brake Shoe Co. and prior to that was on the staff of the maintenance of way, welding department of the Erie Railroad Co.

» «

Herman M. Brown has been made general manager of the Huntington works of the International Nickel Co., Inc., to succeed **Arthur S. Shoffstall,** who is retiring after a service of 36 years with International Nickel. Mr. Shoffstall will continue as a consultant to the head office of the company.

Mr. Brown has been with the company as assistant general manager since 1921 and previously was superintendent of the Chesapeake & Ohio Railway's Huntington shops for ten years. He is succeeded as assistant general manager by **John A. Marsh,** formerly general superintendent.

» «

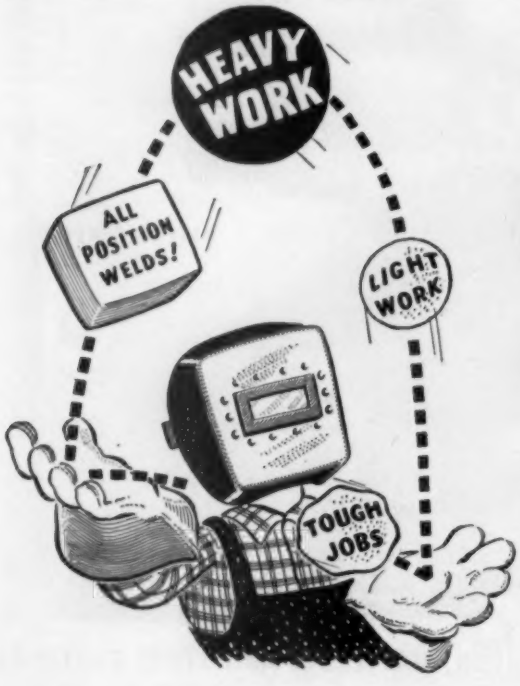
E. J. Zimmer, Jr., has been appointed assistant to L. B. Keplinger, vice-president and director of sales for Rheem Manufacturing Co. He was formerly with Remington Arms Co. In his new position, Mr. Zimmer will concentrate on the development of sales for projected postwar products including the current lines of automatic water heaters, space heaters, boilers and pressure tanks.

» «

Ralph O. Anderson has been made district manager for the Norton Co. of a newly formed sales territory to be known as the west central Rocky Mountain district. He will make his headquarters at Denver. Mr. Anderson has been with Norton for over 30 years, for the last few of which he has been doing special sales work.

» «

Samuel D. Lemmon, research metallurgist for Lukens Steel Co., Coatesville, Pa., since November, 1943, has been promoted to the position of assistant engineer of tests. He joined Lukens in 1939 as an observer in the research department.



it's Easy WITH A MARQUETTE

Run of the mill production and maintenance jobs are "duck soup" for Marquette Welders, but it's the extra tough ones that bring out the remarkable performance characteristics of these versatile machines. There you'll get a real demonstration of the outstanding time and money savings possibilities of electric welding over all other methods of metal fabrication or repair.

Backed by years of leadership in the a.c. field and brilliantly utilizing the inherent advantages of a.c. current, Marquette Welders are low in original cost and low in operating cost . . . producing flawless welds on sheet metal or heavy castings without the slightest trace of "magnetic blow" and with the speed and economy that is the delight of the most critical operators.

Buy the Best . . . Buy Marquette

AUTOMATIC VOLTAGE CONTROL—INSTANTANEOUS HEAT SELECTION—ALL ASBESTOS INSULATION—NEGLIGIBLE UPKEEP—COMPLETELY EQUIPPED

10 MODELS, 125 to 400 amps.

Send for free, 24 page, illustrated booklet

MARQUETTE MFG. CO., INC. Minneapolis 14, Minn.

MARQUETTE
REGISTERED U.S. PAT. OFFICE
a.c. arc welders

BEST CHOICE
BECAUSE

it does both jobs!

The WILSON "BUMBLEBEE"

TRANSFORMER AC WELDER

Here's what makes the Wilson "Bumblebee" your best choice in AC welding machines:

1. It's a production-boosting, AC welder that provides 15% to 30% more welding per work day, with reduced power costs. Because of its high electrical efficiency and improved power factor, it uses 30% to 35% less power to do the same work as an equivalent DC machine.

2. It's also highly recommended by the majority of manufacturers of automatic welding units as an ideal transformer to use with their equipment. A number of 300 or 500 ampere "Bumblebee" machines, connected in parallel, will furnish ample power for your automatic welders.

This flexibility offered by the "Bumblebee," plus its sturdy, trouble-free construction – high electrical efficiency – and improved power factor, make it an excellent welder for every modern metal-working plant. Be sure to mail the coupon for free catalog that gives full details. Other Wilson AC welders are made in sizes from 100 to 1000 amperes.

SEND FOR CATALOG

★ BUY UNITED STATES WAR BONDS ★

WE
Air Reduction Sales Co.
60 E. 42nd St.,
New York 17, N.Y.

Gentlemen:

Please send to me by return mail a copy of the "Bumblebee" AC Machine Catalog (ADW-53).

Name.....

Company.....

Address.....

City..... State.....

AIR REDUCTION

General Offices: 60 East 42nd Street, New York 17, N. Y.
In Texas: Magnolia Airco Gas Products Co. General Offices: Houston 1, Tex.
Offices in all Principal Cities

Kingsley L. Rice, publisher of *Power Plant Engineering,* Chicago, was elected president of Associated Business Papers at the recent annual meeting held at the Westchester Country Club, Rye, N. Y. He succeeds **J. S. Hildreth,** vice-president of the Chilton Co., who becomes chairman of the board.

» «

Thomas J. Wood has been appointed supervisor of arc welding of the American Welding & Mfg. Co., Warren, O. Mr. Wood has had some 20 years of welding experience. He went to Westinghouse Electric & Mfg. Co. in 1934 after ten years with the Standard Metal Products Co. and served for two years as welding foreman of the Mansfield plant. From Westinghouse, he joined the Wayne Mfg. Co., shipfitters at Waynesboro, Va., as supervisor in charge of welding.

» «

Dr. I. A. Oehler has been appointed chief process engineer of the American Welding & Mfg. Co., Warren, O. He was formerly open hearth metallurgist, Buffalo district, Republic Steel Corp.

» «

S. E. Hackett, former president of the Jones & Laughlin Steel Corp., has joined Porter-Blairsville Co., Blairsville, Pa., as vice-president in charge of production.

ENDURING —
is the word for
DIAMALLOY
WELDING ELECTRODES

We want you to try
DIAMALLOY on the *toughest*
hardfacing job
in your plant . . . Abrasion
Corrosion - Shock . . . whatever
your problem may be
. . . there is a Diamalloy
hardfacing rod that will give you
longer service . . .
better service . . . Drop us
a line - describe your most
troublesome application
or just mail the coupon
for free samples . . .

DO IT NOW

SEND FREE SAMPLES OF DIAMALLOY TO

Company_____
Address_____
Buyer_____

Send Samples Checked ☐ 1-8 ☐ 5-32 ☐ 3-16 ☐ 1-4
Please Supply Jobber's Name - Address in Your Territory

The DIAMALLOY Co.
GOWANDA, N. Y.

J. B. MacNeill, formerly manager of switchgear engineering, has been appointed manager of the Switchgear and Control Div. of Westinghouse Electric and Mfg. Co. He succeeds **R. A. Neal,** recently elevated to vice-president.

» «

H. O. Teeple, chemical engineer, has joined the technical service group of the development and research division of The International Nickel Co., Inc. He will specialize in corrosion problems.

» «

John J. Prochaska, for several years Cleveland district manager for the Cleveland Automatic Machine Co., has been appointed general sales manager to succeed **George A. Collier,** resigned. **V. J. Hannon,** formerly chief of general accounting, has been promoted to the post of Cleveland district manager.

» «

Henry H. Ritchotte has been appointed manager of the contractors' tool division of the Independent Pneumatic Tool Co., Chicago. He was formerly manager of contractor tool sales at Philadelphia and was previously a district manager for Johns-Manville Sales Corp.

» «

John G. Farrar, formerly assistant comptroller, was elected comptroller of the General Electric Co. at a recent meeting of the board of directors. He succeeds the late **Ira D. LeFevre.**

» «

Ernest Mahler, executive vice-president of the Kimberly-Clark Corp., Neenah, Wisc., has been elected to the board of directors of the Allis-Chalmers Mfg. Co. He takes the place of **R. G. Hutchins,** who retired after 31 years of service on the board.

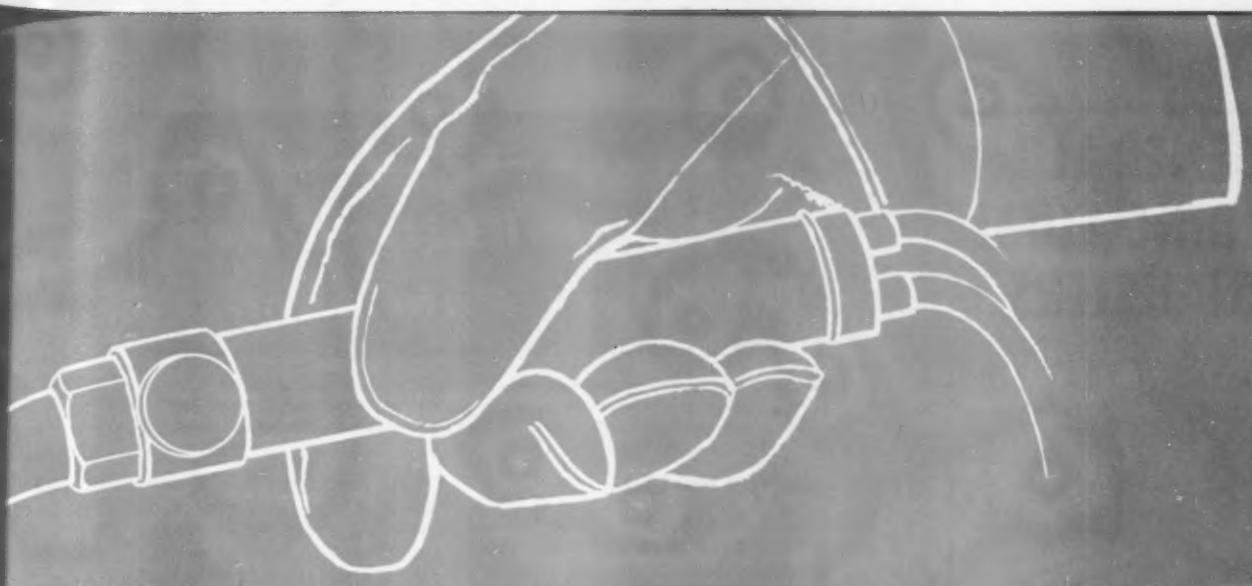
Died . . .

Francis Patrick Gormely, president of the Haynes Stellite Co. and several other subsidiaries of the Union Carbide and Carbon Corp., died at his home in New Rochelle, N. Y., on July 13 after a short illness. He was 56 years of age.

Mr. Gormely went to work for Union Carbide Company in 1909 as an electrician at the Sault Ste. Marie, Mich., plant. In 1926, in addition to other duties, he became general manager of Haynes Stellite, and in 1929 he was made vice-president and general manager of all companies of the metallurgical group. He was elected president of these companies on May 22, 1944.

» «

Daniel C. Green, chairman of the board and chief executive officer of the Cleveland Pnuematic Tool Co. and its subsidiary, Cleveland Pneumatic Aerol, Inc., died Sunday, July 2, at the Little Traverse hospital, Petoskey, Mich., after a seven weeks' illness. His death was attributed to undulant fever.



..and here is WHY you should send for it TODAY!

EUTECTIC *Low Temperature* Welding is NEW! It is one of the most *revolutionary welding developments* of modern times and *The Eutectic Welder* is the only publication that tells you all about it.

Welding at temperatures below the fusion point of base metals is made possible by employing the phenomenon of surface alloying. Joints welded with EUTECTIC *Low Temperature* Welding Rods are *smoother, stronger, better color matched* and *more machinable* than those obtainable *by any other welding or brazing process.*

All metals can be joined by EUTECTIC *Low Temperature* Welding. No special skill is required. All standard methods of heating are employed: gas—arc—furnace and others.

Be the first to introduce the EUTECTIC *Low Temperature* Welding process and its great advantages into your company. Write for *your* copy of *The Eutectic Welder* TODAY! Fill in and mail the coupon or write on your company letterhead and your copy will be sent FREE by return mail. Thereafter you will receive it regularly every month.

The Eutectic Welder is published by the Engineering and Research staff of the Eutectic Welding Alloys Company and is supplemented by valuable contributions from enthusiastic users in all fields of industry and manufacturing.

SENT FREE ON REQUEST

Low Temperature
WELDING RODS

EUTECTIC WELDING ALLOYS COMPANY
40 Worth Street, New York 13, New York Room.....
Please send me latest issue of *The Eutectic Welder* and place my name on your regular mailing list.

Name.....

Company..... **Position**.....

Address.....

City.....

"GENERAL" WELDING FUME EXHAUSTERS

For effective elimination of the *Noxious Fumes* from

Arc Welding

Galvanized Iron Soldering

Spray Painting, Etc.

TWO TO TEN INLETS—

For multiple hose connections in shop and field operations.

SINGLE INLET UNITS—

For exhaust from booth collector ducts; and in the smaller units.

High Velocity Exhaustion by High Speed Centrifugal Fans for Small, Easily Handled Hoses

SEMI-PORTABLES—

Movable by crane hook or carrying bar; or for fixed (duct) service. ¾ to 15 motor horsepower.

PORTABLE "JUNIORS"—

40 to 100 pounds in weight; one or two inlet nozzles.

Self-closing caps on all nozzles.
Rugged, all-steel construction.
Metered for continuous service.
Controls protected within base.

Bulletin CB-103 gives specifications and dimensions for the 28 types and sizes comprising the "General" line.

GENERAL BLOWER CO.

403 N. Peoria St., MONroe 0244
New York CHICAGO 22, ILL. Detroit
Pittsburgh Philadelphia Cleveland

Helpful Literature Just Published

The following reviews are of recent publications of interest to those in the welding industry. Unless otherwise stated, they may be obtained without cost by writing to the manufacturers listed.

Flame-Cutting Booklet

"New and Improved Oxy-acetylene Methods for Steel Foundries" is the title of a 32-page, letterhead-size booklet describing new and improved methods of performing common steel foundry operations by flame-cutting and other flame processes. Principal stress is laid upon the removal of risers by machine flame-cutting. A number of examples of this practice are illustrated, and comparisons are drawn with the hand-torch method of riser removal.

Other processes treated in this booklet are: flame-scarfing to remove pads left after riser removal; flame-gouging for the removal of webs, fins and defects; flame-descaling for cleaning normalized or annealed castings; the oxygen lance and its various uses in the steel foundry; flame-hardening for the localized hardening of steel castings. The booklet is profusely illustrated throughout and attractively printed in two colors. Altogether it is a useful and interesting work. **Air Reduction Sales Co.**, 60 East 42nd St., New York City 17.

» «

Flux Bulletin

Krembs & Co., 66 West Ohio Street, Chicago, has issued an engineering bulletin describing 89 different fluxes, each for specific types of welding, brazing or silver soldering jobs. The bulletin explains how to select the proper flux for 57 different metals and also gives the proper flux for various makes of cutting-tool tips.

» «

Spot-Welder Catalog

A 58-page catalog, No. CE-44W, is entitled "Spot Welders" and shows all types of standard and many special resistance welder machines manufactured by the **Eisler Engineering Co.**, 740-770 S. 13th St., Newark 3. With over 300 illustrations and diagrams, this catalog covers welding equipment in capacities ranging from 3 to 500 kva.

» «

Regulator Bulletin

A new 16-page, letterhead size bulletin, Form 40, illustrates the design and construction of certain types of Victor single and two-stage reduction regulators. This bulletin, states manufacturer, deliberately discloses design and construction details which are often hidden from the view of the prospect. **Victor Equipment Co.**, 844 Folsom St., San Francisco 7.

» «

Welding Cement Folder

A four-page, 7 by 10 in. mailing piece discusses the use of Wesley's welding cement. This cement is squeezed from a tube onto small fixtures, which are stuck fast in five seconds in preparation for welding. The cement is consumed in welding so that no trace of it remains. **Wesley Lacquer Co.**, 93-95 Fourth St., Brooklyn 31.

» «

Truck Bulletin

Lyon-Raymond die handling hydraulic trucks are pictured and described in the six-page, letterhead-size Bulletin 135, "Die Handling Made Easy." These trucks, states the bulletin, make a one-man job out of a two- or three-man job by handling the dies from the rack to the press and back again. **Lyon-Raymond Corp.**, 1549 Madison Ave., Greene, N. Y.

» «

Production Cut-back Facts

Why production cut-backs arise in the war program and what the procedure is when they occur is told in a little 6½ by 4 in., 40-page booklet, "Adjustment of Production Cut-backs," prepared by the **Army Service Forces**, Washington, D. C.

» «

Silver-Brazing Bulletin

The uses of "Sil-Fos," "Easy-Flo" and "Easy-Flo No. 3" silver-brazing alloys in the marine field are detailed in No. 27 "Low Temperature Brazing News," published by **Handy & Harman**, 82 Fulton St., New York City 7. Suggested applications are given for shipyards, for marine copper shops and for the manufacture of marine equipment.

» «

Trimmer Bulletin

The **Quickwork Division of Whiting Corp.**, Harvey, Ill., announces its Bulletin QW-119 featuring the applications and operation of "Quickwork" stamping trimmers. The eight-page booklet is illustrated with pictures and drawings to help enable the reader to understand the range of work that may be handled by these new products.

"Orienting the New Worker"

One highly important factor in good morale is the orientation of the new employee, according to a recent report, "Orienting the New Worker," prepared by the **Policyholders Service Bureau of the Metropolitan Life Insurance Co.**, 1 Madison Ave., New York City 10. According to this study, the aims of any program of orientation are to give the new worker confidence in himself and the company, to make him feel that the company is interested in him and will treat him fairly, that his fellow workers and his supervisor are glad to have him in their department and that he will like his job and have a chance to get ahead. The complete schedules of two companies in the orientation of new employees are presented as an appendix to the report.

Copies of this study will be sent to executives who address the Bureau on their business stationery.

» «

Positioner Bulletin

General information on position welding, including its advantage and use, is given in a 40-page, letterhead-size bulletin, No. 2150, just published by **Ransome Machinery Co.**, Dunellen, N. J. Ransome positioners from a small hand-operated unit to a 20-ton heavy-duty machine are illustrated, and dimensions, load capacities and other detailed specifications of each model are furnished. Installation photographs showing various models in diversified use are reproduced throughout the text.

» «

Abrasives Book

An elaborate 76-page book, "Norton Folks Contribute to Industry," has been published by the **Norton Co.**, Worcester, Mass., for presentation to its employees. The objective was to make them, and particularly the newer employees, more familiar with the types of products the company is producing and the importance of abrasives in industrial production. The presentation booklet is printed in several colors and is copiously illustrated. Two artist's crayon drawings of scenes in the Norton plant are reproduced for the front and back end papers.

» «

Basic Facts about Cerium

Most chemists, physicists, and metallurgists know that cerium is a metallic element of atomic number 58 and atomic weight 140 belonging to the group of elements known as "Rare Earth Metals." Few in the welding industry, however, would guess that this particular rare earth can be used in welding electrodes to act as an arc stabilizer. This and many other suggested applications for cerium are given in a 3¾ by 9 in. folder, "Some Basic Facts about Cerium," published by **Cerium Metals Corp.**, 522 Fifth Ave., New York City 18.

Valve "Dos and Don'ts"

Eleven good tips on the handling and care of valves are graphically illustrated in the new 11 by 17 in. "Dos and Don'ts" chart released by the **Reading-Pratt & Cady Div. of the American Chain & Cable Co., Inc.**, Bridgeport, Conn. Printed on heavy stock for posting, this chart stresses the protection angle by pointing out the common mishandlings that often reduce valve life. Sketches portray the right and wrong ways of handling each situation.

» «

Electronic Products Book

In order to tell what it is doing in the war effort as well as what it hopes to do for industry when peace comes, **North American Philips Co., Inc.**, 100 East 42nd St., New York City 17, has prepared a 28-page, 8 by 10 in. booklet intended to serve as a general introduction to the company and its products. This company was organized by a group of executives and engineers from the pre-Nazi Philips Lamp Works at Eindhoven, Holland, and now has three plants producing piezo-electric quartz crystals, electronic tubes, special communication devices, fine wire, molybdenum and tungsten rod and wire and X-ray apparatus and tubes.

Milburn Type N Cutting Torch. Meets Highest Performance Standards.
MILBURN
Regulators (High & Low Pressure)
Cutting & Welding Equipment
Spray Guns
Portable Carbide Lights
Write for Literature
The ALEXANDER MILBURN Company
1400-1416 W. Baltimore St. · Baltimore · 23 · Md.

Save WELDER'S Eye-Strain with THERMACOTE Lenses

Obtain more and better footage by relieving welders' eye strain. Laboratory tests report 35.4% less light loss in transmission through Thermacote lenses than with uncoated cover glasses. Millions of spatter-proof, non discoloring, plastic coated (not lacquered) Thermacote lenses now used by shipyards, fabricating plants, etc. Free samples from your nearest dealer.

THERMACOTE CO.

120 ARLINGTON STREET
NEWARK 2, NEW JERSEY

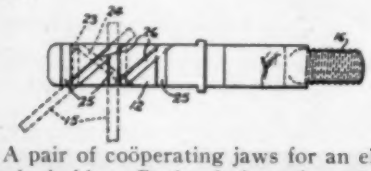
1101 McLAUGHLIN BLVD.
PORTLAND, OREGON

420 SOUTH SAN PEDRO ST.
LOS ANGELES, CALIFORNIA

FROM THE PATENT OFFICE

Electrode Holder

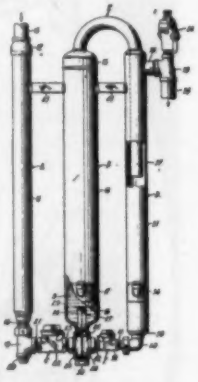
2,351,852. **Winkler C. Gosch,** Hamden, Conn., assigned one-half to **Martha S. Churchward** and one-half to **Myrlon A. Farnham,** both of New Haven, Conn. Filed Feb. 16, 1943. Issued June 20, 1944.



A pair of coöperating jaws for an electrode holder. Both of these jaws have transverse grooves in their opposing surfaces, but the grooves in one jaw are out of alignment with the grooves in the other jaw. The grooves in one jaw are adapted to receive an electrode of smaller diameter than are the grooves in the other jaw.

» «

Water Seal



2,352,256. **Maurice P. De Motte,** Indianapolis, assigned to **Union Carbide and Carbon Corp.,** New York City. Filed July 11, 1940. Issued June 27, 1944.

A hydraulic back-pressure arrester for welding gases comprising an inlet reservoir, a main reservoir, a conduit communicating between the outlet of the inlet reservoir and the inlet of the main reservoir, a check valve adapted to be closed by back pressure, a liquid trap having a gas outlet and a liquid outlet, a conduit for conducting gas to the latter, a conduit for returning trapped liquid to the main reservoir, and a check valve in the last-named conduit for preventing the flow of liquid from the main reservoir to the trap. The second check valve is adapted to permit the flow of fluid through the second conduit from the trap when the pressure on the side of the check valve toward the trap exceeds the pressure on the opposite side. A screen in the main reservoir below the liquid level is arranged so that gas from the first conduit will pass through.

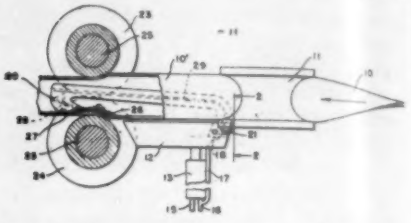
In this arrester is an opening engaged by a plug. A support member is secured to the plug and to the screen, and both support and screen are removable through the opening as a unitary assembly with the plug.

» «

Tube Flash Removal

2,352,306. **James L. Anderson,** Closter, N. J., assigned to **Air Reduction Co., Inc., New York City.** Filed April 22, 1942. Issued June 27, 1944.

An improvement for the removal of

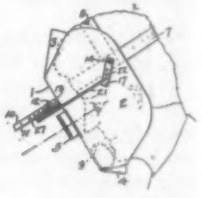


flash from the seams of welded tubes. An oxygen scarfing jet is directed against the flash beyond the region of welding and as a concurrent operation with the welding; the scarfing jet is directed against the flash at a point where the metal of the seam is still above its kindling temperature.

» «

Shield for Weldor's Hood

2,352,417. **Alvin O. Thorson,** Puyallup, Wash. Filed May 3, 1943. Issued June 27, 1944.

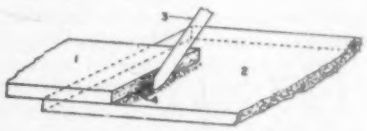


This patent pertains to a weldor's hood pivotally supported by a headband and adapted to lie in front of the face or over the head. A shield pivotally supported by the hood is adapted to extend from the hood, over the window, when hood is in front of the face or to lie on the window when hood is over the head. The shield is so connected with the headband that it is automatically swung on its pivot in relation to the window as the hood is moved in relation to the wearer's head.

» «

Arc-Welding Method

2,348,728. **John D. Crecca,** United States Navy. Filed April 7, 1941. Issued May 16, 1944.



A method of making a lap joint by placing arc-initiating material along the location of the weld, in contact with the work to be welded, and disposing a welding electrode at the proper arc distance from the work and adjacent the material. When an electric potential is imposed, an arc is initiated by the previously placed material while the electrode is maintained at the spaced distance from the work. The electrode is then moved along the line of junction of the two plates at a rate to make the weld. Simultaneously, the electrode is fed toward the work at a rate to maintain the proper arc distance. The arc-initiating material functions to reestablish the arc instantaneously if it is extinguished during the course of the welding operation.

Save Time While Reloading!

How TO SPEED UP WELDING OPERATIONS!

Use This Dual Automatic Welding Fixture!

Automatic Welding-head Positioner — adaptable to your own holding fixture.

THIS Acme dual fixture arrangement permits practically constant use of an automatic welding head, because one of the fixtures can be reloaded while the other is engaged in the welding operation.

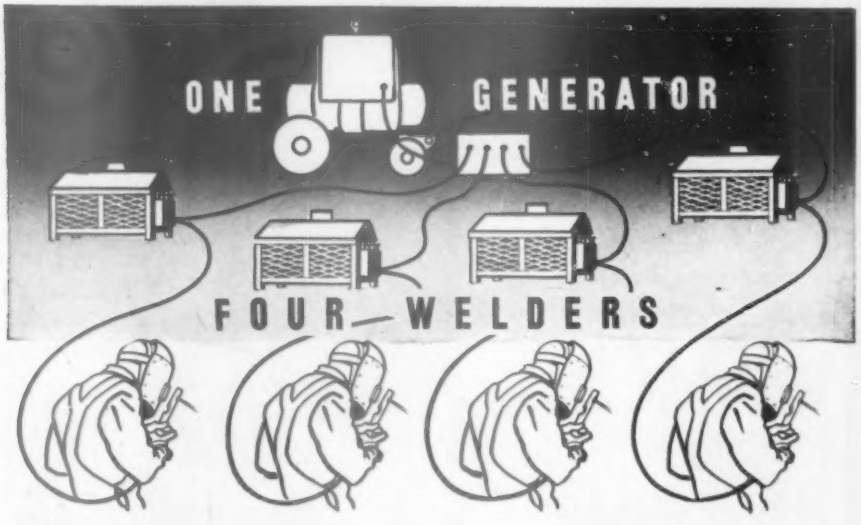
The holding machine can be set to revolve at any angle from vertical to horizontal. (Illustration shows a wheel being welded at 45° angle.) Positioner arm swings from one fixture to the other, locking in proper position. Speed of rotating the work is adjustable, as desired.

WRITE
for information relating to your particular welding fixture problem

ACME Manufacturing Co.
1642 HOWARD ST. • DETROIT, MICH.

THE BIGGEST NEWS IN WELDING TODAY!

STEVENS
TUFFLINE
WELDING RESISTOR UNIT



IMMEDIATE DELIVERY

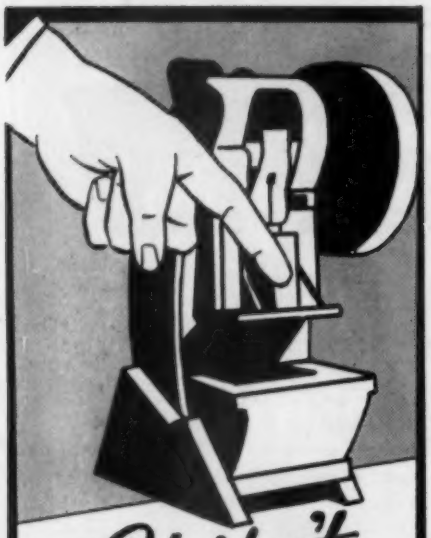
$96.00 LIST PRICE

Discounts on Request

Generators are hard to get . . . expensive. Even with high priorities, deliveries are long delayed and uncertain. The remedy for this situation is to install STEVENS TUFFLINE WELDING RESISTOR UNITS. They multiply your generating capacity by 3 and 4 times at a small fraction of the cost of additional generators.

Thousands of Stevens Welding Resistor Units are working night and day on production lines from coast to coast, including nearly 75% of the nation's shipbuilding concerns. Demonstrations of any Tuffline product given without obligation. Catalogs showing all Tuffline products sent upon request.

C. H. STEVENS & CO. 216 E. 45TH ST., NEW YORK 17, N. Y. TEL.: MU 2-4894
SACRAMENTO, CALIF.: 3216 SACRAMENTO BLVD., SACRAMENTO 5-2388



It isn't necessary

TO TEAR DOWN A MACHINE TO WELD A BROKEN CAST-IRON PART!

NO PREHEATING IS REQUIRED WHEN YOU WELD CAST-IRON WITH

AGILE

YELLOW ELECTRODES

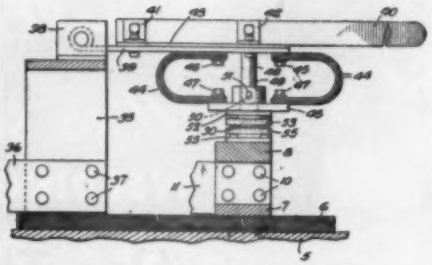
AGILE Yellow Electrodes have rapid fusion qualities and the weld metal has a soft fine dense grain that possesses greater strength than cast-iron. The weld metal is file soft and easily machineable.

AMERICAN AGILE CORPORATION

5806 HOUGH AVENUE
CLEVELAND 3, OHIO

AGILE ACTARC

*Send for free Literature

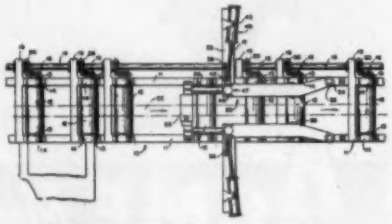


Carbon-Brazing Apparatus

2,348,884. **Leonard S. Dewees,** Baltimore, assigned to **Western Electric Co., Inc.,** New York City. Filed Jan. 1, 1943. Issued May 16, 1944.

This brazing apparatus has a pair of carbon electrodes connected to a pair of flexible leads, one of which supplies current to one electrode. An electrode support is connected to the flexible leads and is pivotally supported for slight movement with respect to the handle.

» «



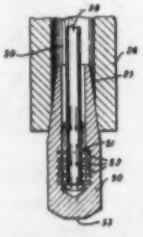
Flame-Scarfing Machine

2,351,653. **James L. Anderson,** Closter, N. J., assigned to **Air Reduction Co., Inc.,** New York City. Filed Oct. 30, 1941. Issued June 20, 1944.

A flame-scarfing machine for billets. It has a torch-positioning device with portions for holding torches in position to operate over two contiguous longitudinal surfaces of a billet, a support for this device, a bearing about which the support is movable to shift the torch-positioning device toward and from the plane of one of the surfaces, and a separate bearing about which the support is also movable to shift the torch-positioning device toward and from the plane of the other surface. Thus the torch elements can follow the surfaces on both straight and crooked billets.

» «

Spot-Welding Electrode



2,351,230. **Raymond E. Powell,** Westfield, N. J., assigned to **Western Electric Co., Inc.,** New York City. Filed Dec. 5, 1942. Issued June 13, 1944.

A spot-welding electrode having a work face and a circular passageway for a cooling fluid. The walls of the latter provide a heat-transfer area terminating short of the work face. A plurality of equally spaced annular grooves formed in the outer wall of the passageway increase the heat-transfer area and disturb the travel of the cooling fluid through the passageway in order to effect a reduction of the work-face temperature.

A *new* "Proved-Performer"

HAMPTON JUNIOR AC WELDER

The new approved "Hampton Junior" offers a welding range from 20 to 200 amps. . . . operates on either 110 or 220 volts . . . welds 1/16" to 3/16" electrodes . . . infinite number of welding heats and a spatterless arc. Low initial and maintenance cost.

HAMPTON ELECTRIC MFG. CO.
1105 Pine Place New Kensington, Pa.

Dollars can't be made this way . . . but there's money in using

COLONIAL GLOVE AND GARMENT SPLITS

Welders demand their combination of greater comfort, safety, and durability. Available in all weights for men's and women's gloves and garments in large spread whole kips and side splits. Write for samples.

COLONIAL TANNING CO.
Glove and Garment Leather Division
MILWAUKEE, WIS.

C-F POSITIONERS

as far as the eye can see . . .

through the light haze of this gigantic welding department extend triple rows of C-F Positioners. From this almost endless production line (the photograph is taken from the half-way point) each day come heretofore unheard of numbers of fabrication with all seams, joints and unions strongly and smoothly welded "downhand".

There are no handling problems or delays, for on C-F Positioners each welder positions his weldment for succeeding welds with a pushbutton control—can rotate it at any desired speed (360°) or tilt it to any angle up to 135° beyond horizontal.

Write for Bulletin WP-22

CULLEN-FRIESTEDT CO. **1309 S. Kilbourn Ave.** **Chicago 23, Ill.**

Fight-worthy!

LOOKS LIKE a yard full of junk! And it is! But it's the kind of scrap that, when converted into Uncle Sam's war materiel, is blasting Tojo and Hitler ever closer to defeat's brink.

And you may be sure the scrap is being cut into handy sizes with typical Sight Feed efficiency:

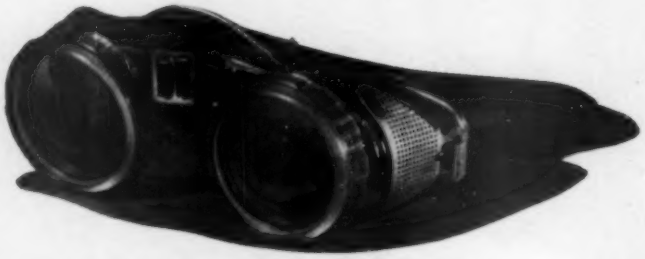
1. At savings up to 75% in acetylene costs.
2. Without delivery delays from gas "bottlers."
3. And without a single work stoppage due to failure of the operator to "see his charge!"

THE *Sight Feed* GENERATOR COMPANY

Sales: Richmond, Indiana • Factory: W. Alexandria, Ohio

Two Additions to the METRO SAFETY EQUIPMENT Line

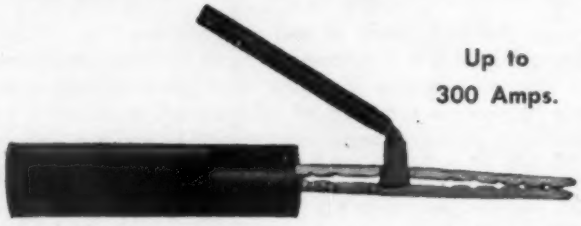
Metro's New Coveralls



Transparent for chipping and grinding—shatterproof lenses—as shown above.

Also available in Black for welders.

Metro's New Electrode Holder



Up to
300 Amps.

SEND FOR OUR NEW CATALOG. DISTRIBUTORS WANTED.

Metro Manufacturing Company

38-11 Thirty-first Street Long Island City 1, N. Y.

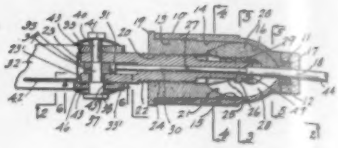
Off the Floor Deliveries!
ON
TRINDL SUPER INDUSTRIAL *ARC WELDER*
DESIGNED FOR HIGH SPEED PRODUCTION ARC WELDING

TRINDL SUPER INDUSTRIAL ARC WELDERS, the result of many years of careful engineering and "job tested" research, are rolling up impressive production records. Acclaimed for superior performance, ruggedness, dependability, and economical operation.

For better, faster welding, easy-to-operate TRINDL SUPER INDUSTRIAL ARC WELDERS will help step up your production schedules 20% to 40%. Manufactured in a range of distinctive sizes to accommodate every type of shop and production welding job.

Trindl Welders, Electrodes, supplies and accessories, available for immediate delivery, will save you both time and money. Write, wire or phone for full details.

TRINDL PRODUCTS, LTD. 11 EAST 23rd STREET AR CHICAGO 16, ILL.

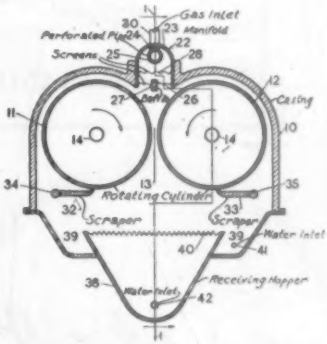


Electrode Holder

2,350,426. **George H. Thompson**, Oakland, Calif. Filed June 8, 1943. Issued June 6, 1944.

A chuck for an electrode holder comprising a handle, a sleeve having a chamber circular in cross-section but ellipsoidal longitudinally, and jaws formed so that their ends fit the respective circular ends of the pocket. Each jaw has an internal groove approximately midway of its length. A chuck-adjusting member is threadedly operable in the sleeve, and a pivot connects one end of this member to the handle for relative angular adjustment. The chuck-adjusting member has a collar at its other end fitting into grooves in the jaws to actuate them through rotation of the sleeve relative to the chuck-adjusting member. The jaws are thus caused to pivot about the collar to respectively grip and release an electrode with the advance and retraction of the chuck-adjusting member.

» «



Acetylene Manufacture

2,349,007. **Jan D. Ruys**, Pittsburgh, and **Leonard Goldstein**, Concord, Calif., assigned to **Shell Development Co.**, San Francisco. Filed March 14, 1941. Issued May 16, 1944.

A method for producing acetylene in which a gaseous mixture containing a hydrocarbon and oxygen is subjected to incomplete combustion in a reaction zone at the ignition temperature of the mixture. The gaseous mixture is conveyed, while maintaining the flame combustion, towards the locus of minimum clearance between the surfaces of two oppositely rotating, cooled metal drums revolving on parallel axes. The necessary incomplete combustion takes place in a plane extending through the small clearance between the drums. The linear velocity of the gaseous mixture while it passes through the locus of minimum clearance is maintained substantially above the flame velocity. The gaseous products resulting after incomplete combustion are hence withdrawn at a temperature below that of flame combustion. Acetylene is recovered from these gaseous products.

61 years behind the brand—a great service record
for
LICHTMAN LEATHER★

Would you like to compare the leather you are getting in your protective garments, gloves and other welders' accessories with a sample of LICHTMAN'S chrome-tanned heat-resisting cowhide?

Send a request on your company letterhead for a swatch, without cost or obligation.

You'll see why this tannage so successfully meets the exacting requirements for heavy duty and yet provides wearing comfort.

LICHTMAN J.L.&S. LEATHERS NEWARK, N.J. TRADE MARK

★ Developed to meet specifications of U. S. Navy, American Standards Association, etc.

J. LICHTMAN & SONS

Tanners of Quality Leathers Since 1883

NEWARK 5, NEW JERSEY

WELDED CONSTRUCTION IN MODERN MACHINE TOOL DESIGN Calls For PROPER POSITIONING

Manufacturers of modern machine tools are effecting substantial savings in time and money by positioning machine bases and other weldments with Ransome Positioning Equipment.

The downhand welding position for all weldments, provided by this equipment, assures superior weldments in less time, using a heavier rod and reducing rod waste.

Economy and quality in manufacturing is necessarily part of your post-war plans. Investigate this modern production method. We will be glad to provide the proper equipment for your particular job.

WRITE FOR DETAILS—OUTLINE YOUR SPECIFIC PROBLEM

INDUSTRIAL DIVISION Ransome MACHINERY COMPANY
DUNELLEN, NEW JERSEY
SUBSIDIARY OF WORTHINGTON PUMP AND MACHINERY CORPORATION

This Willson Air Supply Attachment keeps welders in fresh air.

With this Air Supply Attachment installed in a Willson welding helmet, a welder is protected from fumes and gases generated in his work.

"Zinc chills" are risked when brass, zinc or galvanized iron are welded or cut. A worse risk is incurred when lead-painted surfaces are involved. With the Willson Air Supply Attachment respirable air is conducted through flexible tubing to the welder's helmet. Convenient to his hand is an adjustable break-valve coupling where (1) the air flow is regulated; and where (2) complete disconnection can be made, to permit the wearer to leave his work without removing his helmet. This Air Supply Attachment fits any Willson welding helmet.

There's a Willson Safety Service Distributor in every major industrial area.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

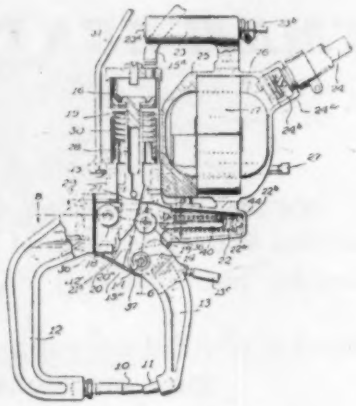
DOUBLE WILLSON

PRODUCTS INCORPORATED

READING, PA., U. S. A. Established 1870

Welding Gun

2,349,835. **Harold A. Strickland, Jr.,** Detroit, assigned to **Budd Wheel Co.,** Philadelphia. Filed Sept. 25, 1941. Issued May 30, 1944.



A welding gun having an electrode that is movable about a pivot and is driven by a motor. There is also a mechanism for changing the ratio of the movements of motor and electrode so as to move the electrode more rapidly when it is remote from the work than when adjacent thereto. Greater pressure is thus applied to the electrode at one time than at another.

» «

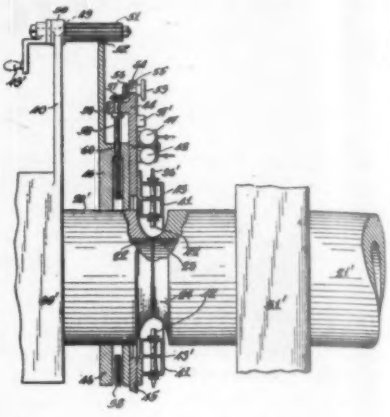
Headband for Helmet

2,349,218. **James W. Welsh,** Providence, R. I. assigned to **Welsh Mfg. Co.,** Providence. Filed Feb. 27, 1941. Issued May 16, 1944.

In a weldor's helmet, a tubular member having an inner surface to contact the wearer's head and a headband having its end portions reduced in width and telescoped within the tubular member. The adjacent faces of the opposed walls of the tubular member are spaced in conformity with the thickness of the end portions, and one of the walls has an opening in which the head of a threaded member is non-rotatably supported with its outer surface flush with the inner surface of the tubular member. A nut on a shank draws the head to bind the reduced portions against relative movement.

Gas Butt Welder

2,350,716. **Herbert A. Bissout,** Merchantville, N. J. and **William Y. Borresen,** Philadelphia, assigned to **W. K. Mitchell & Co., Inc., Philadelphia.** Filed Dec. 13, 1939. Issued June 6, 1944.



A pressure oxy-acetylene welding process for butt welding tubular members having thin opposing lips forming the bottom of a groove between the edges of the members. The ends of the members are first heated to welding temperature by means of an annular burner having spaced outlets extending into the weld groove. At plastic temperature, the ends of the burner outlets are withdrawn from the groove and the weld is completed by pressing one member endwise toward the other.

» «

Magnetic-Testing Apparatus

2,352,371. **John E. Clarke,** Chicago, assigned to **Magnaflux Corp.,** Chicago. Filed Sept. 10, 1941. Issued June 27, 1944.

This patent on the magnetic inspection of engineering materials covers the combination of a specimen to be inspected, a source of direct current, a circuit connected with the specimen for current flow through the latter to magnetize it and a means to produce an initial surge of current of one intensity through the specimen for a predetermined short period of time, followed by current of substantially lower intensity during the period of inspection.

GAS LIGHTERS

ROUND FILE — FLAT FILE — AUTOMATIC

NATION'S LARGEST ASSORTMENT

Lighters for every purpose. Renewal Flints for all makes of lighters. Write for Circular and Prices.

FLINT PRODUCTS CO. . . . Manufacturers

(Established 1930)

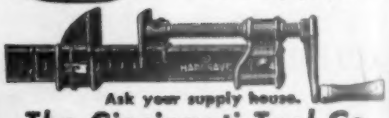
2923 Ave. H Brooklyn 10, N. Y.

HARGRAVE CLAMPS

INDIVIDUALLY TESTED

- WELDING
- DEEP REACH
- QUICK ACTING
- FORGED STEEL

Write for new catalog showing a clamp for every purpose.



Ask your supply house.

The Cincinnati Tool Co.

1944 Waverly Ave. Cincinnati 12, O.

How to cut Welding Costs ...increase production!

See for yourself! Here's the whole story of the new, versatile P&H welding positioner. Here are the facts you want to know . . . how positioned work saves time, saves costs — based on actual case studies. It's all clearly explained — completely illustrated.

Why put off the savings the new P&H 2500 lb. capacity positioner can give you? Send for your copy of Bulletin WP-2 today! The P&H Model WP-2 Welding Positioner provides more operating advantages than you have ever known in a unit of such low price.

Gen. Off.: 4513 W. National Ave., Milwaukee 14, Wis.

HARNISCHFEGER CORPORATION

ARC WELDERS • EXCAVATORS • ELECTRIC CRANES P&H MOTORS • HOISTS • WELDING ELECTRODES

Canadian Distribution: The Canadian Fairbanks-Morse Co., Ltd.

FOR WELDERS ON EXPOSED JOBS!

the M·S·A COMBINATION SKULLGARD-WELDING SHIELD

This practical combination benefits today's welders in shipbuilding, steel, oil, construction, and all other industries where head hazards, bumps and falling objects are encountered. Combining the safety of a laminated bakelite cap-type Skullgard for proved head protection with a one-piece welding shield of tilting design, better comfort and efficiency is assured on the job. The welding shield has a leak-proof lens holder—the Skullgard cap can be worn separately for other work when desired. Ask for Bulletin No. CE-9!

MINE SAFETY APPLIANCES COMPANY
BRADDOCK, THOMAS AND MEADE STREETS · PITTSBURGH, PA.
District Representatives in Principal Cities

CANADIAN RADIUM IN MODERN INDUSTRY

...A THROUGH-AND-THROUGH EXAMINATION WITH CANADIAN RADIUM WILL TELL YOU

Radium's Gamma-rays can penetrate solid steel many inches thick, and provide clear, permanent records of any internal defects.

Plants regularly using Canadian radium to check important metal parts in the earliest production stages, are obtaining valuable data on their foundry technique and insuring the soundness of their products. A radium radiograph often reveals defects which can be corrected — and repairs verified — before entailing added machine, labor and shipping expenses.

In America's Leading Laboratories radium has proven indispensable for conveniently examining steel, bronze, brass and other metal parts ranging from ½ to 10 inches in thickness.

Write for Free Manual

Reliable, profusely illustrated 80-page textbook on the fundamentals and technique of modern Industrial Radiography of Metals with Radium. Specially prepared for the metals industry by our research and technical staff. Write for your copy today, giving your name and company position.

R-44

CANADIAN RADIUM & URANIUM CORPORATION
630 FIFTH AVE., ROCKEFELLER CENTER, NEW YORK 20, N.Y.

Quick! Effective! Safe!

ACETATE CLEANER

This all important cleanser is vitally needed by all workers for removing the dangerous film of dirt, grime and grease from their safety shields. Easily applied, greaseless, Sellstrom Plastic Cleaner acts promptly on all acetate surfaces. Available in handy quart size cans and nominally priced.

Sellstrom

MANUFACTURING CO.

662-8 N. Aberdeen St. Chicago 22, Ill.

"Jorgensen"

CLAMPS

FOR WELDERS

"Jorgensen"

Extra Quality

Series 120 Body Clamps. A large variety of "C" Clamps and Bar Clamps to choose from—

Send for Catalog No. 16

Ask for them by name—

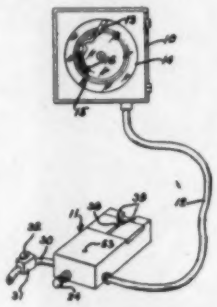
ADJUSTABLE CLAMP CO.

"The Clamp Folks"

426 N. Ashland Ave., Chicago 22, U. S. A.

Center Line
CUT LINE
PIPE LAYOUTS
EASY..RAPID with THE WOLFE ANGLE METER
Most practical device for Templets or laying out directly on Pipe, Sheet Metal, for Bends up to 126° any diameter. Makes "Y" Layouts; Multi-Piece Bends of any number pieces and degree, any Throat, any Diameter and gives Starting Line to Rise of Angle Cut; makes Roof-jacks, Angle Iron layouts, etc. Used in leading plants. PRICES: only $2.00 ea.; 3 @ $1.85 ea. Valuable Instructive Booklet. ALSO companion Mechanic's Protractor aids layout, checking work . . . $1.00; 3 @ 90c ea. Order from mfr.: INTERSTATE SALES CO. Dept. W, 1123 Broadway, New York 10, N. Y. Phone CHelsea 2-7748.
DEALERS: Regular discounts in quantity
ANGLE METER is 12" x 12" overall; sturdy; FLAT model for shop; FOLDING model for field. SPECIFY which.

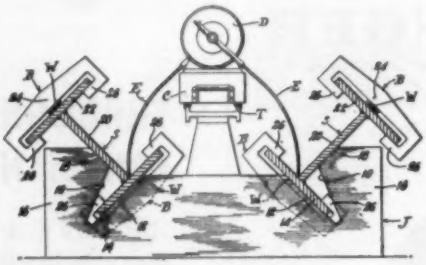
Weld-Testing Apparatus



2,353,056. **Frank Martindell,** Western Springs, Ill., assigned to **Western Electric Co., Inc.,** New York City. Filed March 26, 1942. Issued July 4, 1944.

A weld-strength testing and recording apparatus comprising a pressure-responsive recorder in communication with a cylinder which holds one of a pair of welded-together articles against movement. A piston in the cylinder engages the other side of the weldment. Air under pressure is supplied to the cylinder in order to impart movement to the piston, against a resilient means normally maintaining it in position. The welded-together articles are thus sheared one from the other. When this happens, the air admitted under pressure is permitted to escape from the cylinder by movement of the piston out of blocking association with the cylinder escape port.

» «

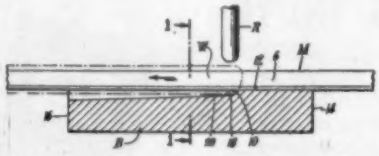


Welding Fixtures

2,352,697. **Alex Edward Dittrich,** Maywood, N. J., assigned to **The Linde Air Products Co.** Filed Aug. 3, 1940. Issued July 4, 1944.

Apparatus for fabricating structural steel shapes, comprising a series of jigs arranged at longitudinally spaced intervals. Each jig is formed with supporting surfaces to engage and support a structural member. A track is mounted on and secured to the jigs, and this track extends alongside of the series of supporting surfaces.

» «



Back-up Plate

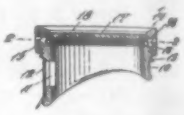
2,352,716. **Lloyd T. Jones,** Berkeley, Calif., assigned to **The Linde Air Products Co.** Filed April 24, 1940. Issued July 4, 1944.

A method of producing a welded joint having a bead of pre-selected form on its back side. The members to be welded are arranged with their adjacent edges in juxtaposition, and the gap formed between them is bridged with a backing chill plate of relatively high heat conductivity and mass. This backing plate has a receptacle, at least a portion of which is the exact shape of the desired bead. When molten metal is progressively deposited in and along the seam and in the receptacle, there is provided a welded joint beaded along its back side in conformation to the receptacle in the back-up plate.

» «

Goggle Eyecup

2,351,358. **Frederic I. Miner,** Providence, R. I., assigned to **Welsh Mfg. Co.,** Providence. Filed Oct. 17, 1940. Issued June 13, 1944.

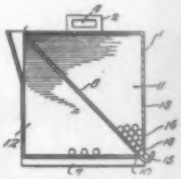


An annular eyecup for goggles having one end to fit the face, a lens covering the other end and a cap over the lens and secured to the cup. Between the other end of the cup and the lens there is located a washer provided with openings for the lateral flow of air. A guide formation on the edge of the cup assists in retaining the washer against both inward and outward movement.

» «

Electrode Box

2,352,685. **Joseph M. Brinker,** Baltimore, assigned one-half to **Michael Podgurski,** Baltimore. Filed May 17, 1943. Issued July 4, 1944.



A box for holding a supply of electrodes. The electrodes are contained within a hopper formed by an inclined partition and the upper part of the box. This partition also forms a compartment for used stubs with the lower portion of the box. The front of the box has an elongated slot near its lower edge and adjacent to the lower end of the partition. A trough outside of the box and adjacent to the slot receives and holds a single electrode. One end of the box has companion openings communicating respectively with the hopper and the stub compartment. A closure member is adapted to cover and uncover both of these openings simultaneously.

» «

Resistance-Welding Apparatus

2,351,722. **Arthur R. Swenson,** Fanwood, N. J., assigned to **Western Electric Co., Inc.,** New York City. Filed Jan. 20, 1942. Issued June 20, 1944.

A resistance-welding apparatus having one electrode to support the parts to be welded and another electrode adapted to grip a wire. The wire-gripping electrode may be moved from a normal position to a welding position, carrying lengths of wire to the parts being welded. The normal position of the gripping electrode may be varied in order to vary the lengths of wire moved to the parts.